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Four Corners Air Monitoring

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This report presents data on mean seasonal total suspended particulates (TSP), sulfates, nitrates and elemental concentrations collected by a 28-station, high volume sampler network operated over a 3-year period in the Four Corners area of Arizona, New Mexico, Utah and Colorado. Estimates of data quality are made based on results of an external quality assurance audit program.

TSP values generally range from 10 to 50 micrograms per cubic meter and the sulfate/nitrate concentrations are generally less than 3 micrograms per cubic meter. All the data collected in this program are available in the U.S. Environmental Protection Agency's SAROAD (Storage and Retrieval of Acrometric Data) data system.

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FOUR CORNERS AIR MONITORING

by

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INTRODUCTION

The Four Corners Air Monitoring Network (FCN) was part of the comprehensive study begun in 1975 to evaluate the impact of energy development in the Western Energy Resource Development Area (WERDA). The WERDA covers the eight Northern Great Plains and Rocky Mountain States and contains sizeable deposits of coal, oil, oil shale, natural gas, uranium, and geothermal resources.

The Four Corners area, covering the southern portion of Colorado and Utah and the northern portion of Arizona and New Mexico, contains existing and proposed power generating facilities, and envelops wilderness areas, National Parks and Indian Reservations. The FCN was activated in 1976 to establish the present air quality and to trace the long term effects of the evolving and potential impact of energy production and resource development on air quality in this generally pristine and rural area.

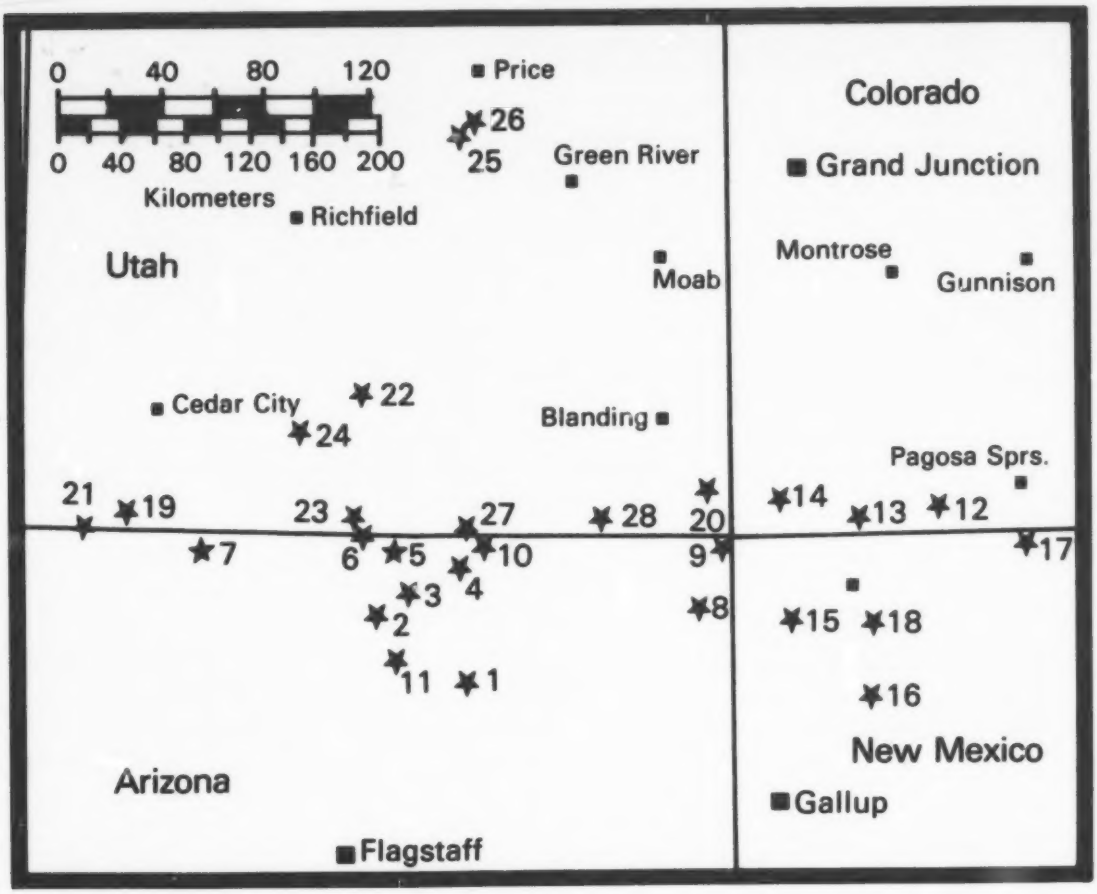
The FCN (Figure 1), designed and operated for the U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory--Las Vegas (EMSL-LV) by the Ute Research Laboratories (URL), collected data at most stations for 3 years. The project was concluded in 1979.

OBSERVATIONS AND CONCLUSIONS

Results of the analyses of samples collected in the FCN document the rural background levels of total suspended particulates (TSP) in the Four Corners area. High volume sampler values for TSP are quite low overall, with means generally ranging from 10 to 50 micrograms per cubic meter ($\mu g/m^3$), although the sites in Escalante and Henrieville show consistently higher concentrations of TSP. Analyses also show that many of the elements were below or at the detection limit.

It was determined that the mean sulfate/nitrate levels are generally less than 3 $\mu g/m^3$. However, using mean values of TSP, sulfate/nitrate or elements, we were not able to document the impact of known major sources on the FCN.

The external quality assurance program resulted in consistent improvement in the quality of the data and was instrumental in identifying problems. Generally, the FCN provided a solid data baseline for impact assessments.



1. Bacobi, AZ, 3/27/76
2. Bodaway, AZ, 6/21/76
3. Coppermine, AZ, 2/2/76
4. Kaibito, AZ, 1/22/76
5. Lechee, AZ, 5/22/77
6. Lee's Ferry, AZ, 10/5/76
7. Moccasin, AZ, 1/27/76
8. Red Rock, AZ, 1/12/76
9. Teec Nos Pos, AZ, 1/20/76
10. Tsa Schizzi, AZ, 4/2/76
11. Tuba City, AZ, 2/16/76
12. Ignacio, CO, 1/19/76
13. Red Mesa, CO, 4/19/76
14. Towaoc, CO, 4/29/76
15. Burnham, NM, 5/17/76
16. Chaco Canyon, NM, 6/30/76
17. Dulce, NM, 5/17/76
18. Huerfano, NM, 4/13/76
19. St. George, UT, 7/14/76
20. Aneth, UT, 2/11/76
21. Bloomington, UT, 2/2/76
22. Escalante, UT, 1/24/76
23. Glen Canyon, UT, 10/13/76
24. Henrieville, UT, 1/24/76
25. Huntington Canyon #1, UT, 4/18/77
26. Huntington Canyon #2, UT, 5/6/77
27. Navajo Mountain, UT, 1/30/77
28. Oljato, UT, 1/23/76

Figure 1. Monitoring site locations and activation dates

RECOMMENDATIONS

To determine regional and local patterns, the data, especially the sulfate/nitrate data, should be looked at on a daily basis, and this analysis be combined with meteorological analysis.

A follow-up study using comparable monitoring and analysis techniques should be undertaken within 10 years to assess trends and impacts of energy development. Should such a program be undertaken, surface meteorological measurements should be made at some if not all station locations for data-interpretation purposes.

NETWORK DESCRIPTION

The FCN consisted of high volume air samplers installed at 28 generally remote rural sites. Sites were located to provide samples most representative of the background and in areas with high potential for future energy resource development--some in the vicinity of existing sources to document their contributions. Site selection was subject to certain limitations: the accessibility of the site, the availability of personnel to operate the sampler, and the availability of electrical power. Use of propane-fueled generators proved unreliable.

The high volume samplers used at each site were standard commercial units equipped with continuous flow recorders. Each sampler was mounted on a 4.6-meter wooden tower to minimize the effect of dust and other ground-level interferences. Two types of filter were used. From 1976 to July 31, 1978, a Gelman spectrographic grade, Type A glass-fiber filter was used. This is a standard 203- x 254-millimeter filter. Beginning August 1, 1978, an EPA filter specially prepared with known amounts of various trace elements was used to provide better results and for easier handling.

ROUTINE PROCEDURES

Prior to April 1977, each sampler was operated for three 24-hour periods weekly. Beginning in April 1977, sampling was performed on even-numbered days, with some adjustments for holidays. Flow calibrations and sampler preventive maintenance were performed at least every 2 months.

Samples form the FCN were shipped through the URL Blanding office to Ft. Duechesne, Utah, for analysis. Each sample was conditioned and weighed to determine the mass of particulates. A portion of each filter was then analyzed using atomic absorption spectroscopy for a number of trace elements. Beginning in 1978, another portion of each of about 67 percent of the filters was analyzed to determine the concentration of sulfates and nitrates. Further details concerning the analytical methods and procedures used were provided in an earlier report (Smith 1979). Results from these analyses were reported to the EMSL-LV where they were incorporated in the SAROAD data base.

QUALITY ASSURANCE

In addition to internal quality control procedures outlined in a previous report (Smith 1979), URL participated in an external quality assurance program. This program was a component of the larger WERDA study and was conducted by Rockwell International, under contract to the EPA.

This quality assurance program began with an audit of URL facilities and procedures, followed by the analysis of "unknown" samples on a regular basis and the exchange of actual field samples. This program provided a check on all aspects of the URL program. A description of each component follows.

FLOW CALIBRATION SURVEY

Rockwell provided URL with a flow-calibration kit containing a series of orifice plates and mounted on a high volume sampler. Measurements of the pressure drop across each plate and of the flow based on the URL flow meter were recorded. These values and the test equipment were returned to Rockwell where flows were computed and compared with the values reported by URL.

In March 1977, the first flow-calibration survey indicated that air flow measurements by URL were 11 percent low. In November 1977, a second flow-calibration survey indicated values only 1.5 percent low. No further flow-calibration surveys were performed prior to the 1979 end of the sampling period. These results suggest an overestimation of concentrations prior to March 1977, by approximately 11 percent. Concentrations reported for the period between March and November 1977 are probably overestimated by an amount between 1.5 percent and 11 percent.

WEIGHING SURVEY

Rockwell routinely provided URL with a set of standard weights to check the accuracy of the URL balance. These weights had been modified by filing and filling to provide masses near 1, 2, and 5 grams. Following normal weighing procedures, URL determined the mass of each weight and reported the results to Rockwell. The results of the three comparisons are shown in Table 1.

TABLE 1. WEIGHING PERFORMANCE SURVEY

Audit date	Aug. 1977	Nov. 1977	July 1979
Difference at:			
1 gram	-2.6 mg	-0.3 mg	-0.1 mg
2 grams	-2.8 mg	0.0 mg	0.4 mg
5 grams	-1.9 mg	-0.2 mg	0.3 mg

The results of the first performance survey showed an effect of approximately -2.4 mg, suggesting a balance adjustment error. After a manufacturer adjustment of the balance, the second and third performance surveys showed errors on the order of -0.2 mg and +0.2 mg respectively. The later results showed generally good agreement. It should be noted that the offset in the first survey would cancel out. Even if this were not the case, errors in weighing would result in no more than about -1.5 $\mu g/m^3$ error in reported TSP.

TRACE METAL ANALYSIS

Periodically, strips from filters analyzed by URL were analyzed by Rockwell using atomic absorption spectroscopy. The results from both analyses were then compared to determine the quality of the data reported. Early comparisons showed generally poor agreement. A potential error of +10 percent due to cutting the filters was suggested. Analytic errors on the order of 30 to 60 percent were also apparent. A later reanalysis by Rockwell placed the error nearer to 70 percent, with URL always reporting lower values.

To identify the source of these discrepancies, a special study primarily involving the exchange of two types of sample was developed. The first type of sample consisted of solutions similar to those resulting from normal filter extraction. These samples were analyzed by atomic absorption spectroscopy to test that portion of the analysis procedure. The second type of sample consisted of specially prepared filters containing known amounts of various trace elements. These samples were similar to normal field samples and tested both the extraction and atomic absorption portions of the procedure. After analysis, the remainder of the filter extract solution was returned to Rockwell to provide another point of comparison.

Although this study did not answer all the questions, it did provide some valuable results. It was concluded that most discrepancies were due to differences in extraction procedures (Cher 1979). Although neither method could be shown to be more valid than the other, the 50 percent HNO_3 method was changed to the 10 percent HCl method used by Rockwell extraction methods. The method used by Rockwell was simpler and gave more consistent recovery efficiencies, resulting in better precision and accuracy values. This method is also consistent with the method used elsewhere in the WERDA.

At the time of this change to the new extraction method, comparisons with Rockwell indicated accuracies on the order of ±10 percent and precisions averaging less than ±10 percent. Subsequent comparisons are summarized in Table 2. In all cases accuracies remained in the ±10 percent range.

TABLE 2. COMPARISON OF TRACE ELEMENTS ABOVE MINIMUM DETECTION LIMITS*

Element	Fe	Mn	Pb	Cu
June 1978	-5 %	-7 %	-	-10 %
February 1979	+8 %	-6 %	-7 %	+3 %

* Percent error = URL-Rockwell/Rockwell

In summary, trace element values reported for the period prior to the first quarter Of 1977 are probably low by as much as 70 percent due to analytic errors. Trace element data reported for the period following first quarter 1977 are probably accurate to within 10 percent.

SULFATE AND NITRATE PERFORMACE SURVEY

Each quarter, Rockwell distrubuted a series of filters containing known concentrations of sulfates and nitrates for analysis. The results of these surveys are summarized in Table 3. On the average, values reported by URL should be within 6.5 percent for sulfates and 8.2 percent for nitrates.

TABLE 3. QUALITY ASSURANCE SULFATE/NITRATE

Quarter/year	Average Percent Difference	
	Sulfates	Nitrates
2/77	7.3	29.4
3/77	6.8	0.1
4/77	5.4	5.9
1/78	4.9	7.3
2/78	12.5	-2.1
3/78	8.5	16.3
4/78	2.9	6.3
1/79	3.8	2.2
	6.5	8.2

DATA ANALYSIS

Data collected during this program have been incorporated in SAROAD, the EPA air quality data base. Several data displays are discussed in this Section. Site descriptions and additional data summaries and displays are presented in Appendix A.

TOTAL SUSPENDED PARTICULATE (TSP) MATTER

Geometric means for all available TSP values are presented in Figure 2. TSP values for most sites are between 15 and 20 micrograms per cubic meter ($\mu g/m^3$). Somewhat higher values were computed for Escalante (43.5), Huerfano (36.0), Tuba City (30.8 and 27.4), Burnham (28.6), Teec Nos Pos (28.3), and Chaco Canyon (28.0). These values may be due to sandy soil and sparse vegetation in the area. Dirt roads are also common throughout the region. Emissions from a sawmill in Escalante may account for the 43.5 value. Emissions from the Four Corners and San Juan Power Plants may contribute to the relatively high values found around Burnham and Huerfano.

Seasonal mean total suspended particulate values are displayed in Figures 3 through 31. Each figure presents data for a single season for the entire

network. These figures show that the minimum TSP values occur during the winter, and highest values in the summer. TSP concentrations are quite variable during the spring. These values were high during the spring of 1976 and 1977 and low during the spring of 1978 and 1979. Much of this variation can probably be attributed to year-to-year variations in precipitation and resulting snow cover.

SULFATES

Mean sulfate values for the period of network operation (Figure 32) generally lie in the range from 2.0 to 2.4 $\mu g/m^3$. Somewhat higher values are reported at Huerfano (3.0), Huntington Canyon I (2.8), Huntington Canyon II (2.9), Teec Nos Pos (2.8), Aneth (2.7), and Tsa Schizzi (2.6). These relatively higher sulfate values may be the result of emissions from the Navajo, San Juan, Four Corners, and Huntington Canyon power plants.

Figures 33 through 61 display the seasonal mean sulfate values for the network. Concentrations are highest during the autumn and lowest during the spring. Summer of 1977 shows high concentrations similar to autumn 1977. In contrast, summer 1978 exhibited relatively low mean concentrations, similar to spring 1978. With this limited data set, the typical summer pattern can not be determined.

No consistent trend in mean sulfate concentrations is evident. A comparison of spring 1977 and spring 1979 values suggests a general increase in mean sulfate concentrations. At the same time, a comparison of summer 1977 and summer 1978 values suggests a decrease in concentrations. Autumn and winter comparisons reveal a generally even mix of increases and decreases.

NITRATES

Mean nitrate values (Figure 62) are in the range of 0.8 to 1.2 $\mu g/m^3$. The overall pattern is quite similar to the sulfate pattern. Similarly, the slightly higher values in some areas may be the result of emissions from local sources.

Seasonal mean nitrate values are displayed in Figures 63 through 91. These values appear to be lowest during the winter and spring and highest in the summer. Autumn values are generally lower than summer values but higher than spring means. Although no consistent long term trend is evident, nitrates do appear to decrease from summer 1977 to summer 1978. At the same time, winter and spring values remain fairly constant.

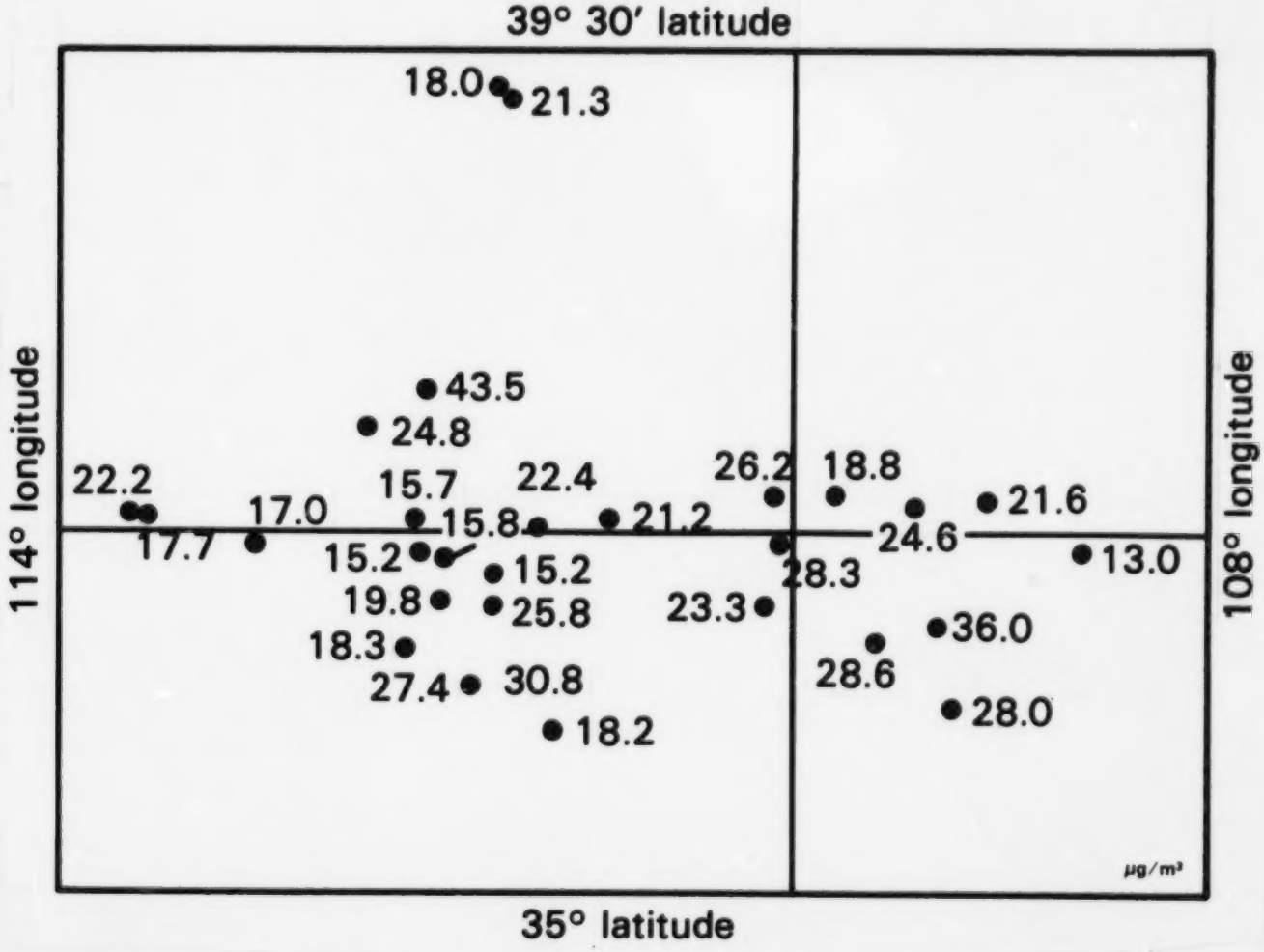


Figure 2. Summary total suspended particulates.

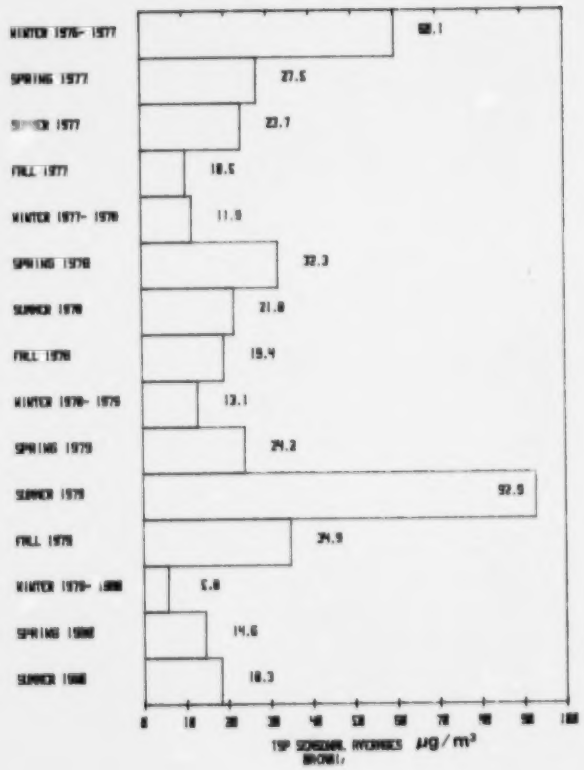


Figure 3. TSP seasonal averages
Bacobi, AZ

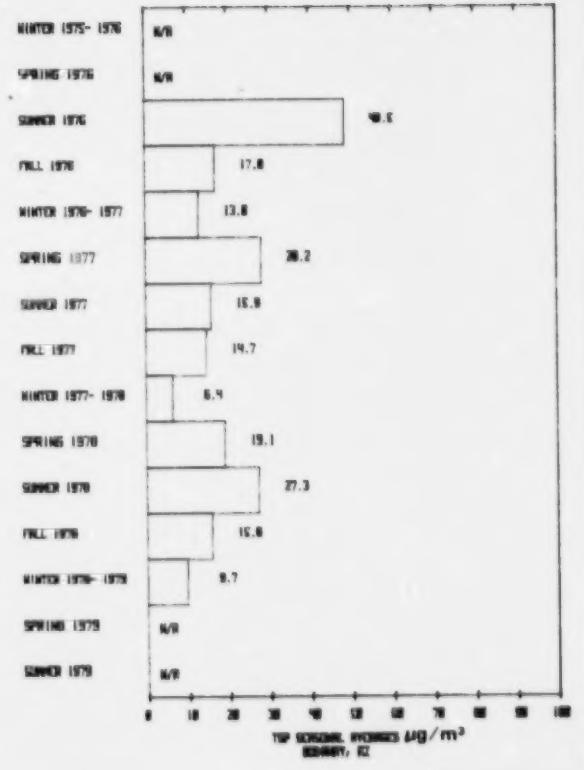


Figure 4. TSP seasonal averages
Bodaway, AZ

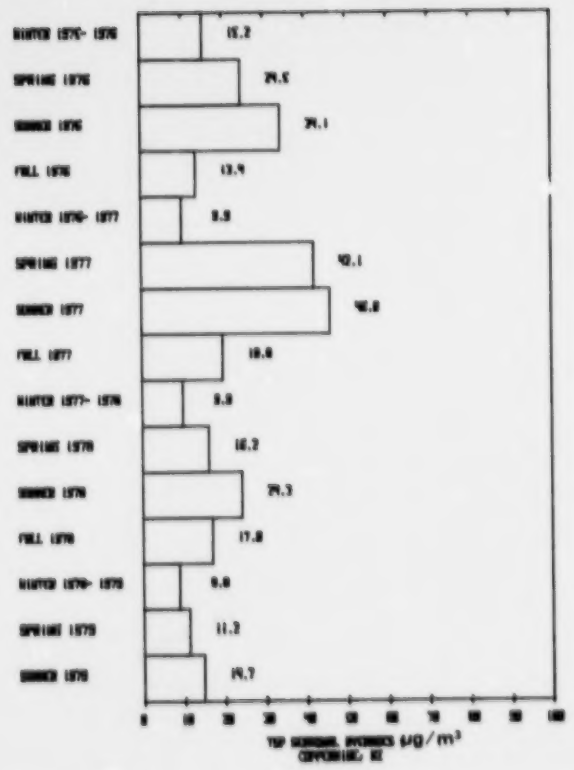


Figure 5. TSP seasonal averages Coppermine, AZ

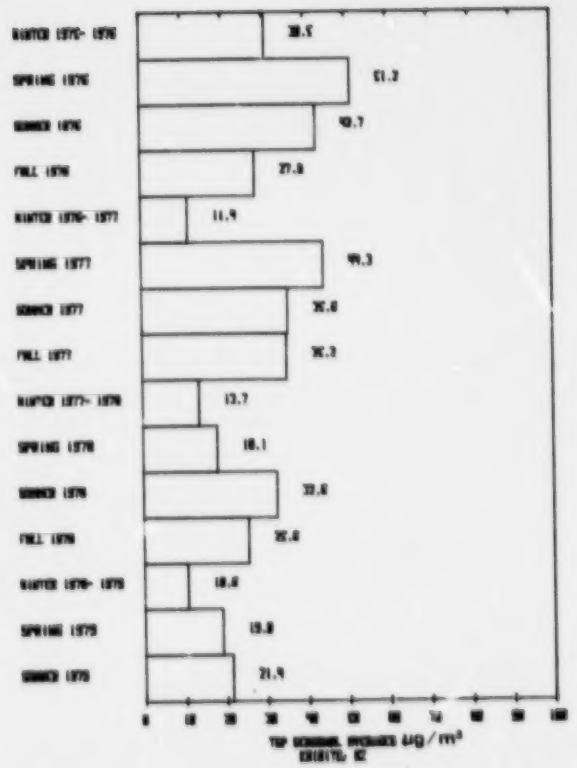


Figure 6. TSP seasonal averages Kaibito, AZ

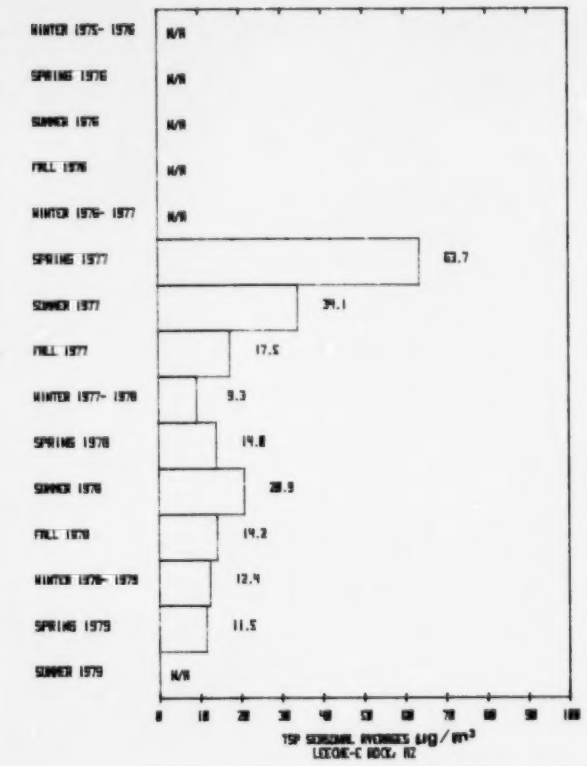


Figure 7. TSP seasonal averages
Lechee, AZ

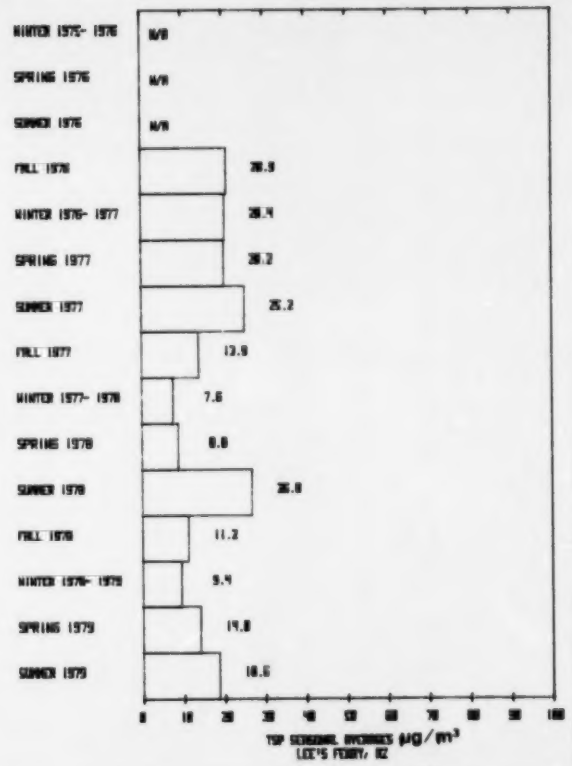


Figure 8. TSP seasonal averages
Lee's Ferry, AZ

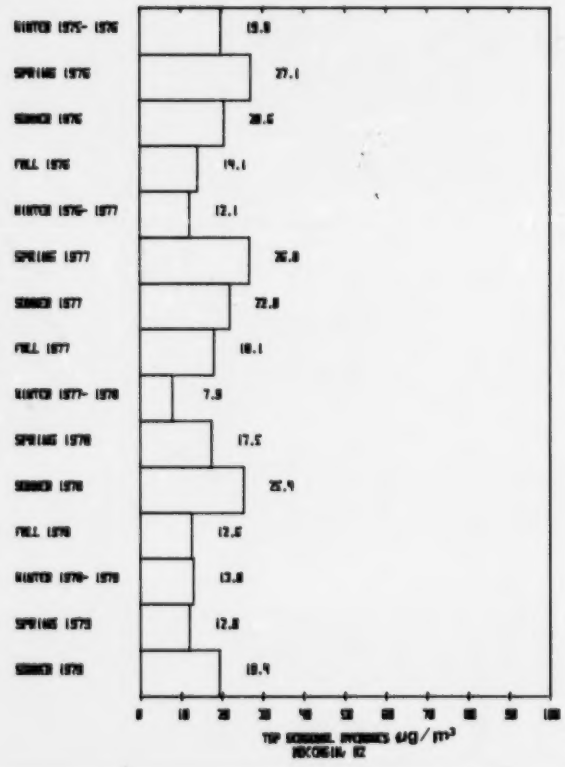


Figure 9. TSP seasonal averages
Moccasin, AZ

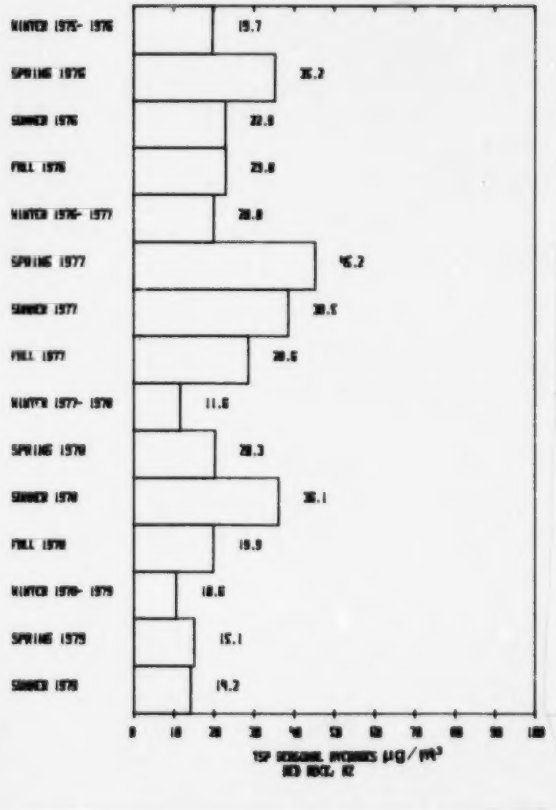


Figure 10. TSP seasonal averages
Red Rock, AZ

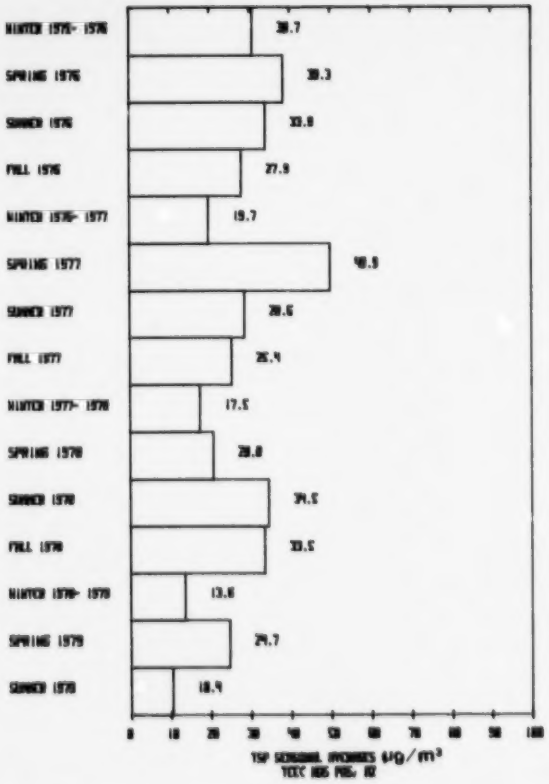


Figure 11. TSP seasonal averages
Teec Nos Pos, AZ

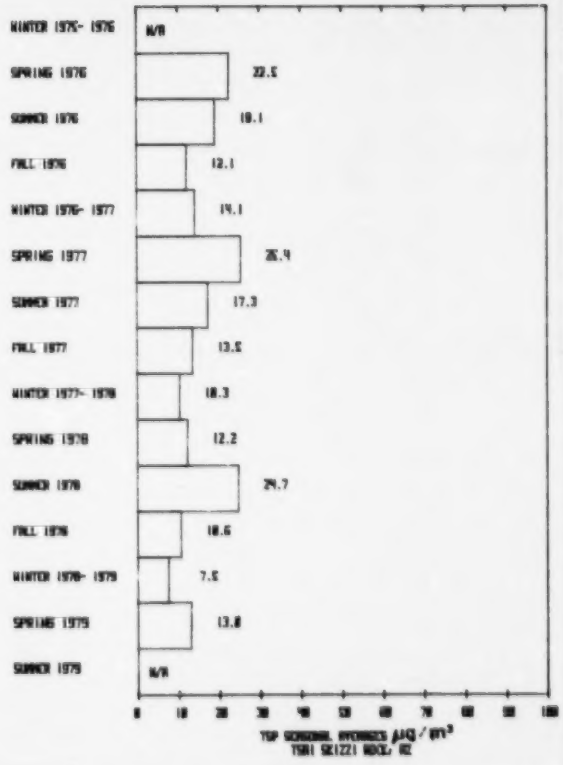


Figure 12. TSP seasonal averages
Tsa Schizzi, AZ

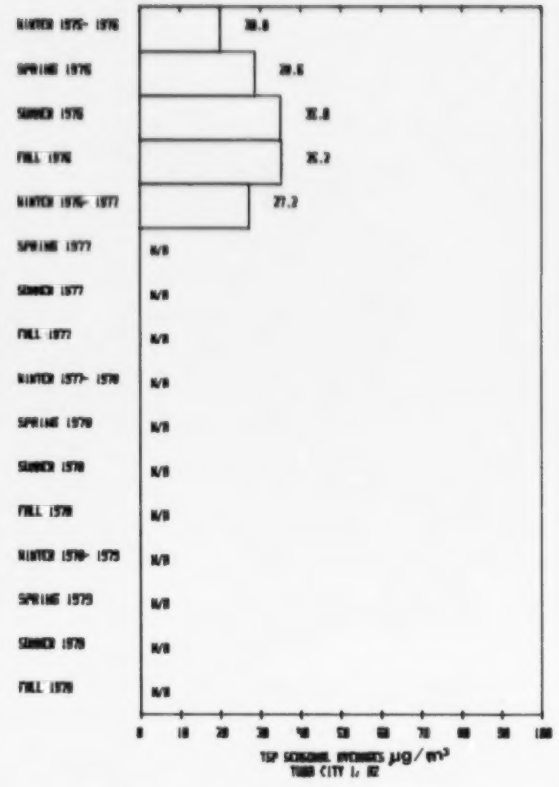


Figure 13. TSP seasonal averages
Tuba City I, AZ

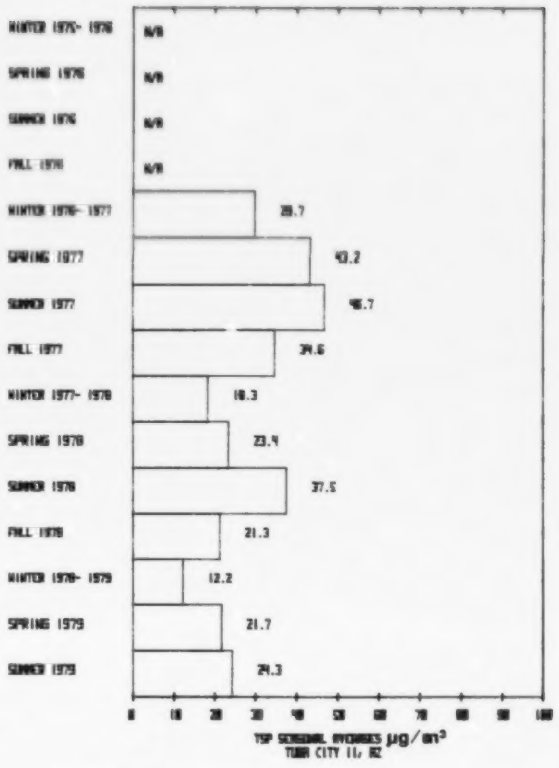


Figure 14. TSP seasonal averages
Tuba City II, AZ

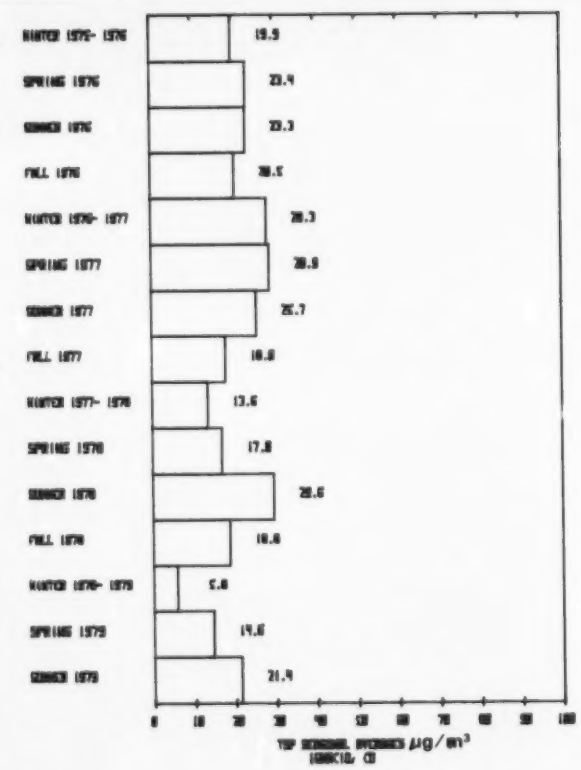


Figure 15. TSP seasonal averages
Ignacio, CO

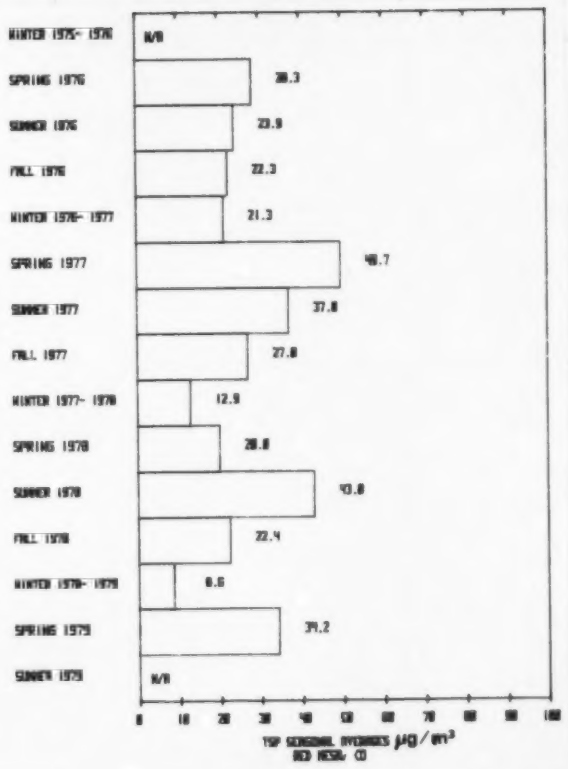


Figure 16. TSP seasonal averages
Red Mesa, CO

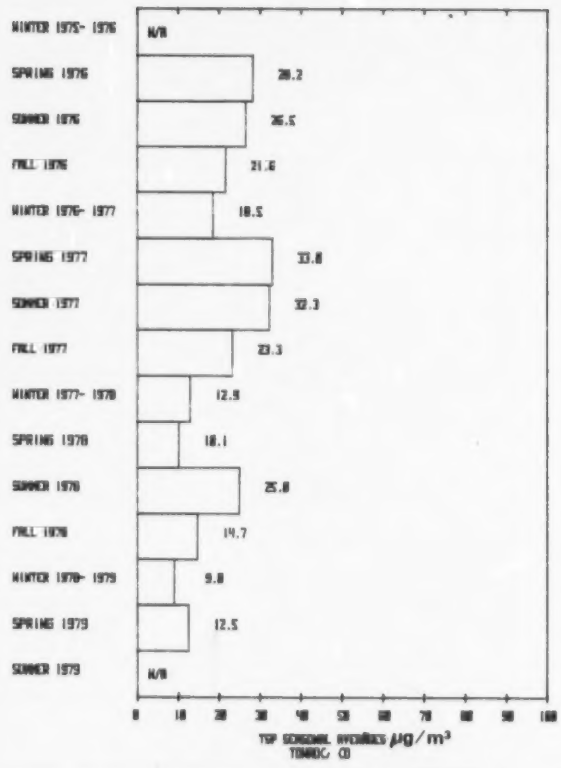


Figure 17. TSP seasonal averages
Towaoc, CO

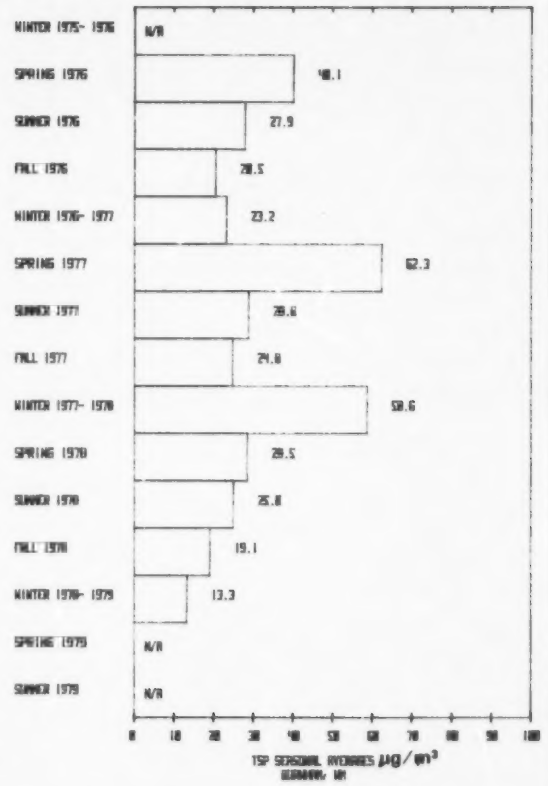


Figure 18. TSP seasonal averages
Burnham, NM

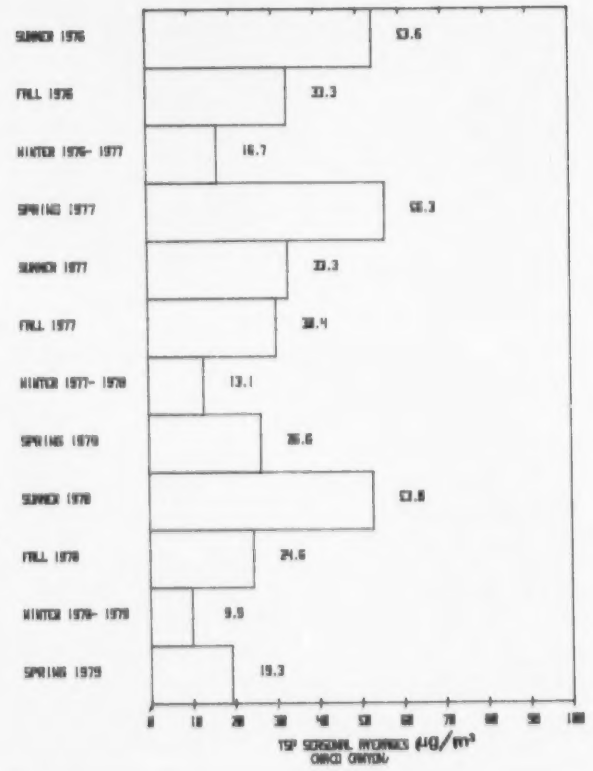


Figure 19. TSP seasonal averages
Chaco Canyon, NM

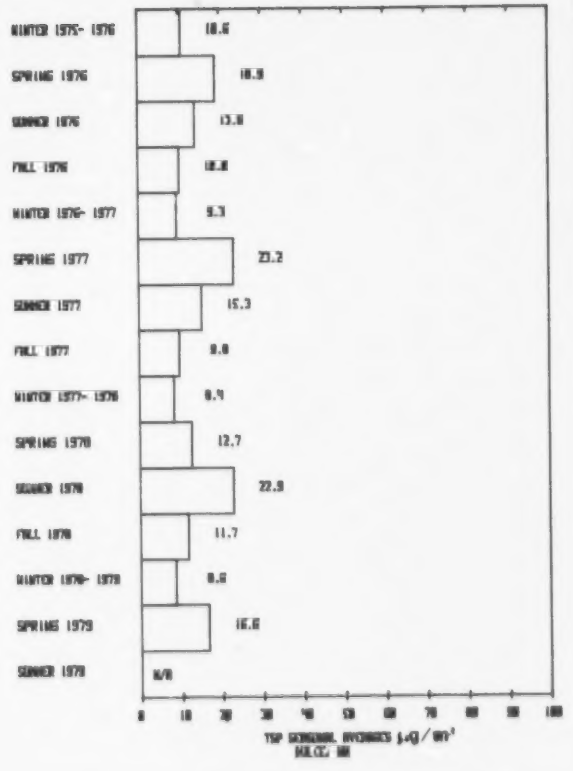


Figure 20. TSP seasonal averages
Dulce, NM

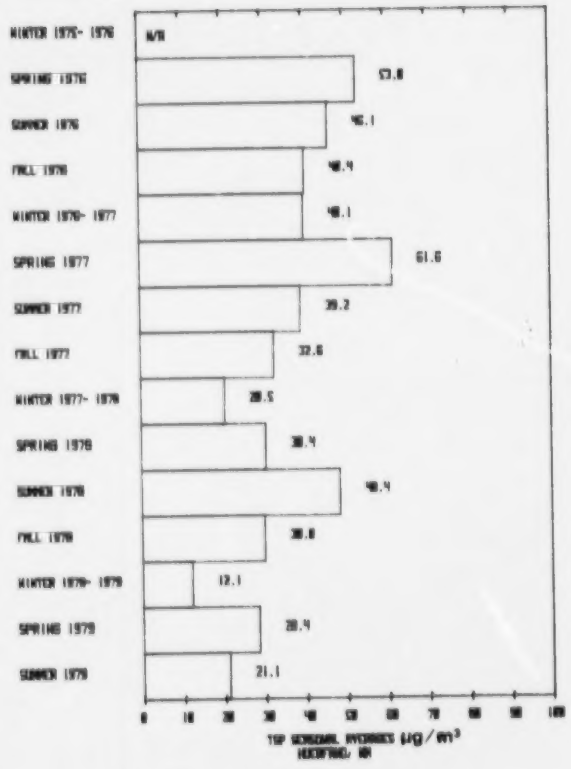


Figure 21. TSP seasonal averages
Huerfano, NM

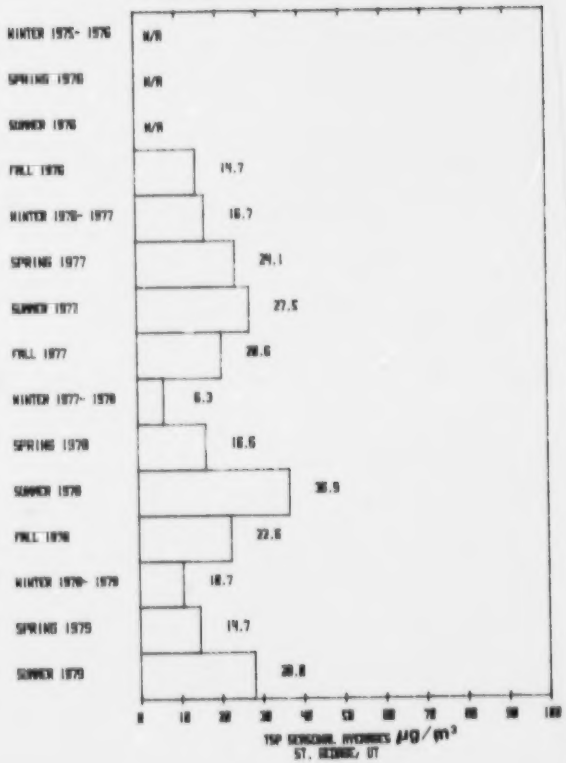


Figure 22. TSP seasonal averages
St. George, UT

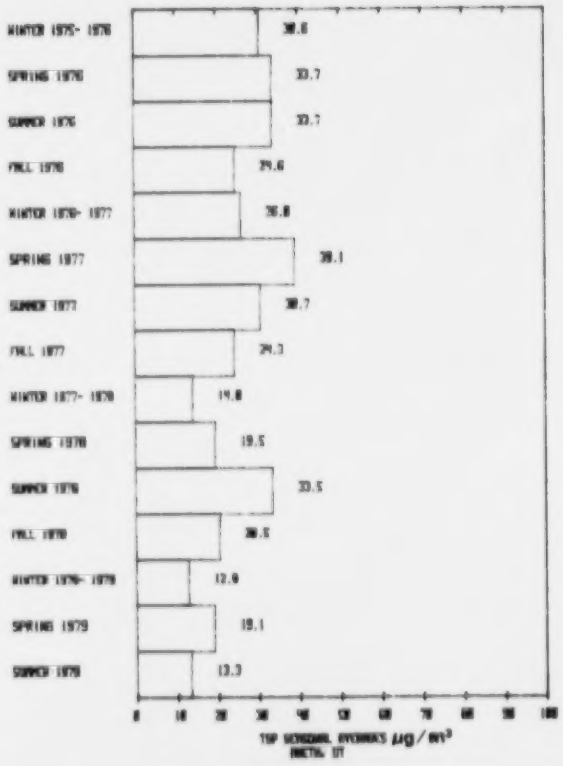


Figure 23. TSP seasonal averages
Aneth, UT

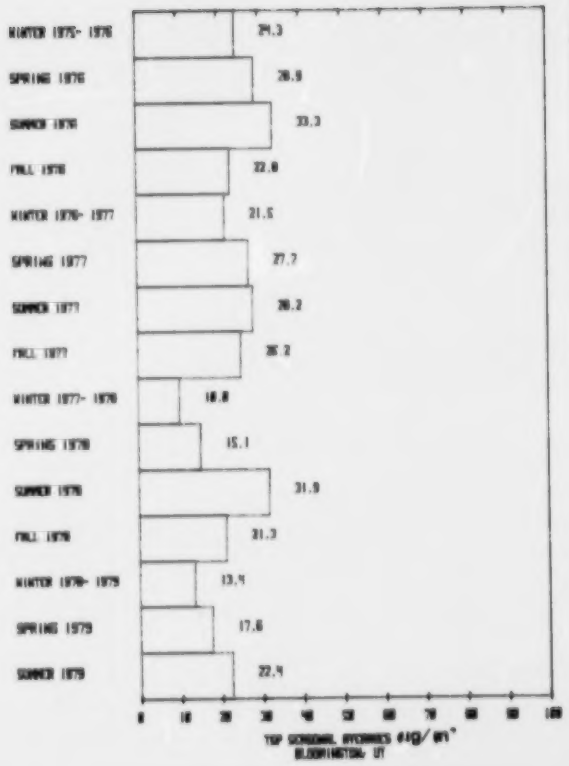


Figure 24. TSP seasonal averages
Bloomington, UT

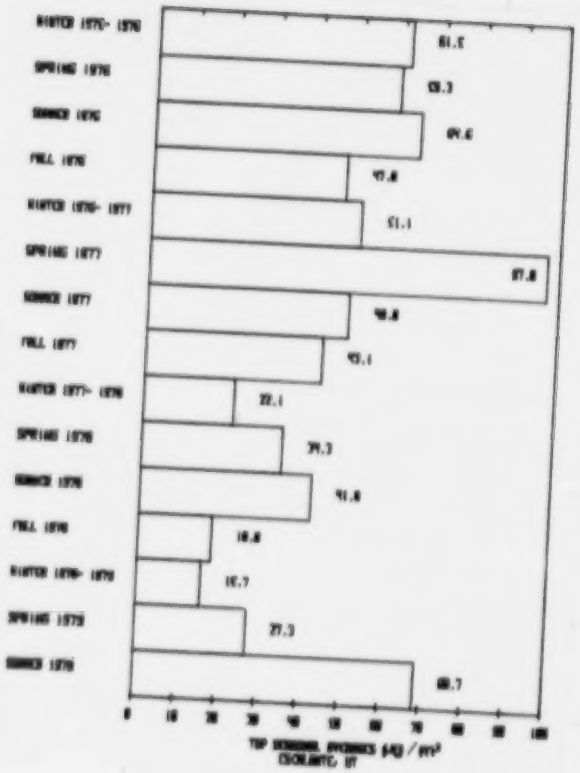


Figure 25. TSP seasonal averages
Escalante, UT

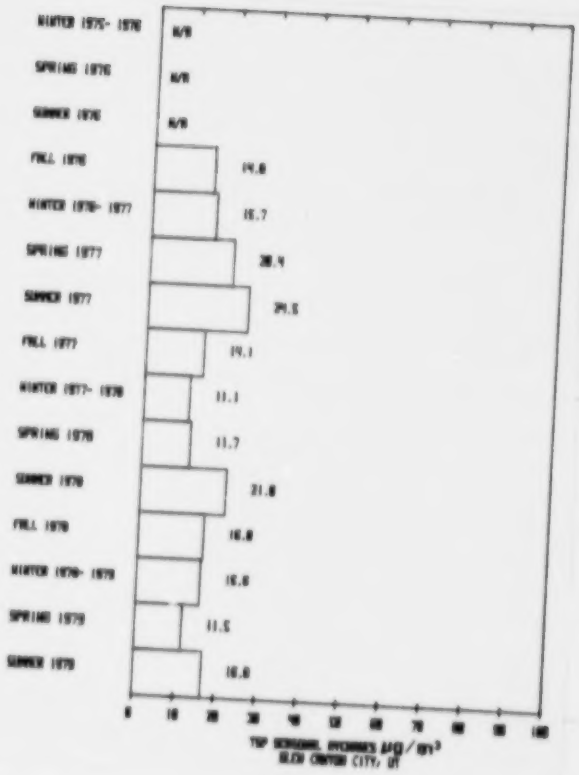


Figure 26. TSP seasonal averages
Glen Canyon, UT

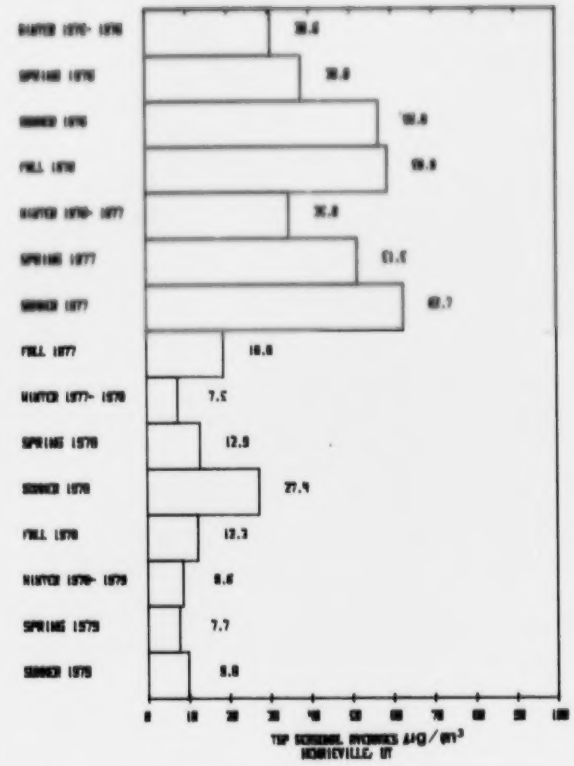


Figure 27. TSP seasonal averages
Henrieville, UT

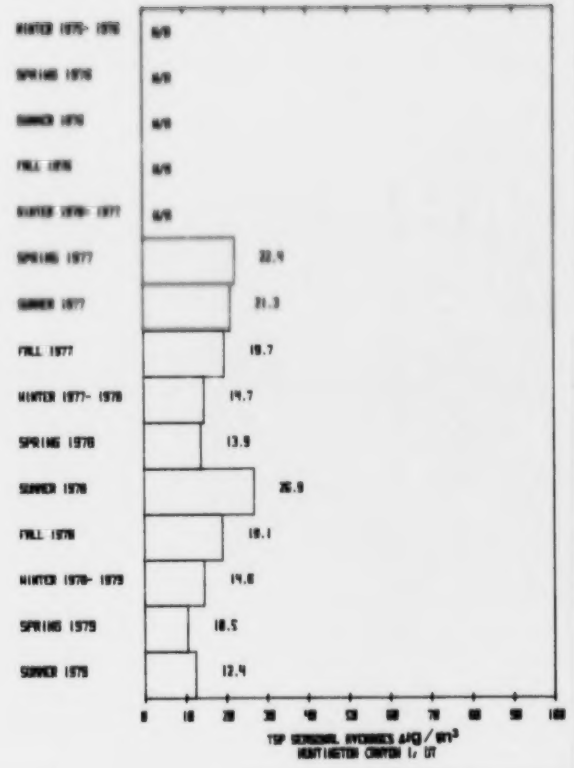


Figure 28. TSP seasonal averages
Huntington Canyon #1, UT

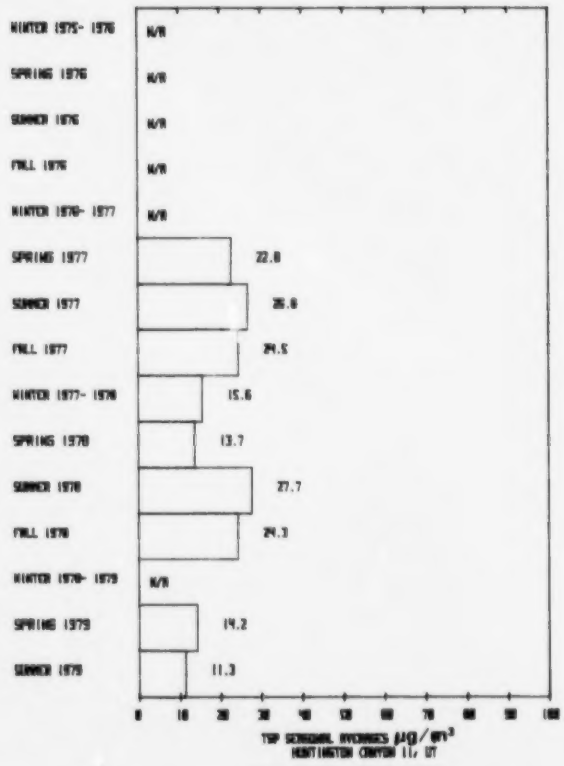


Figure 29. TSP seasonal averages
Huntington Canyon #2, UT

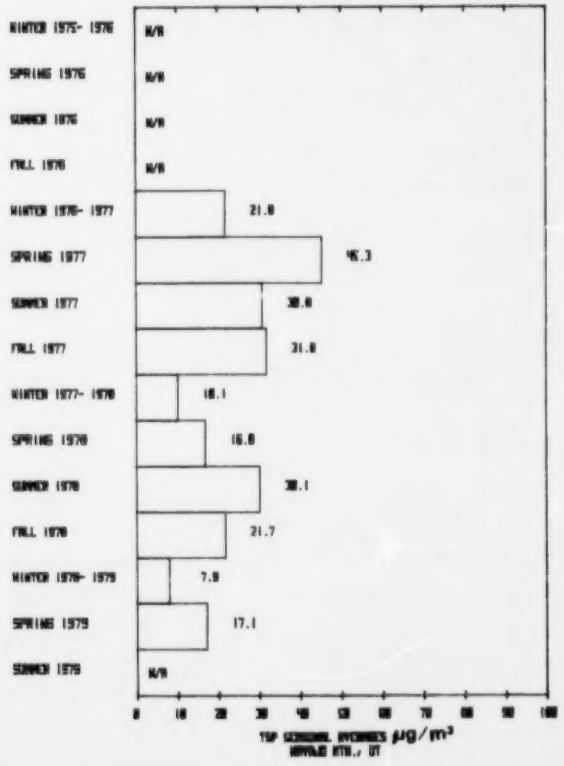


Figure 30. TSP seasonal averages
Navajo Mountain, UT

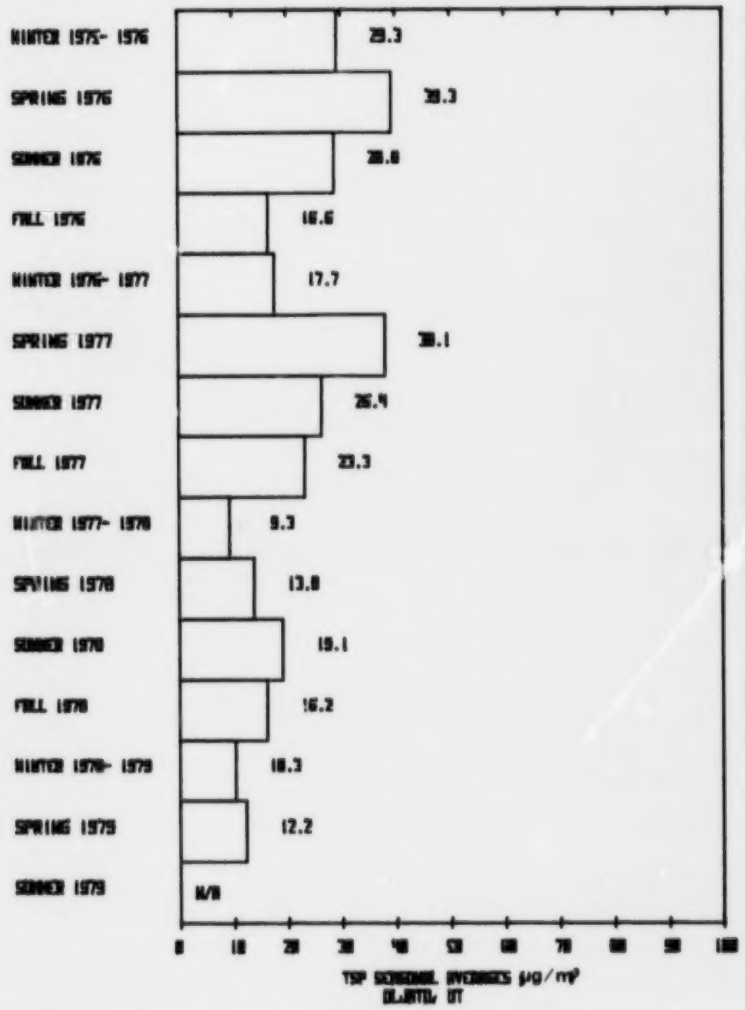


Figure 31. TSP seasonal averages
Oljato, UT

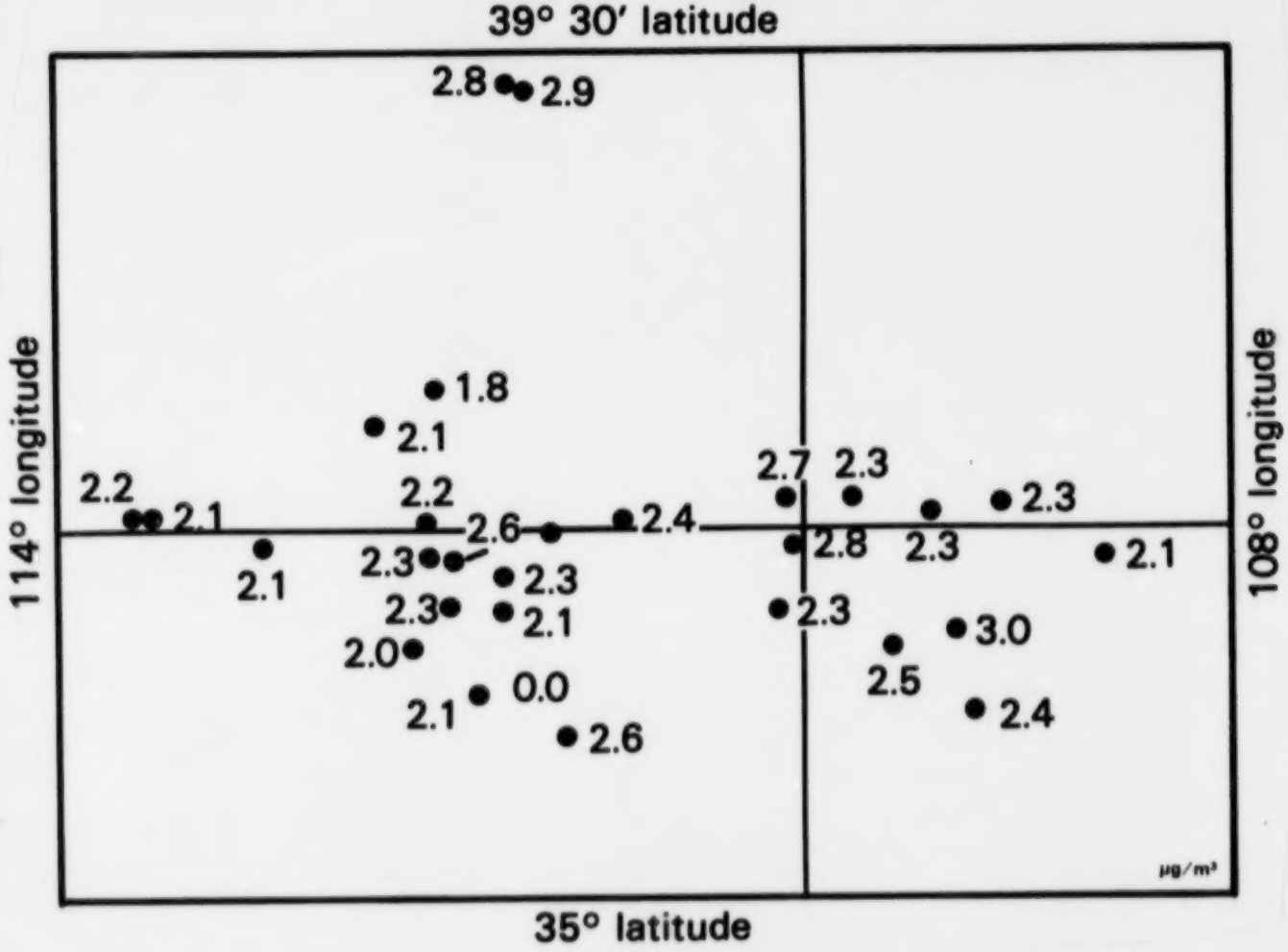


Figure 32. Summary Sulfates

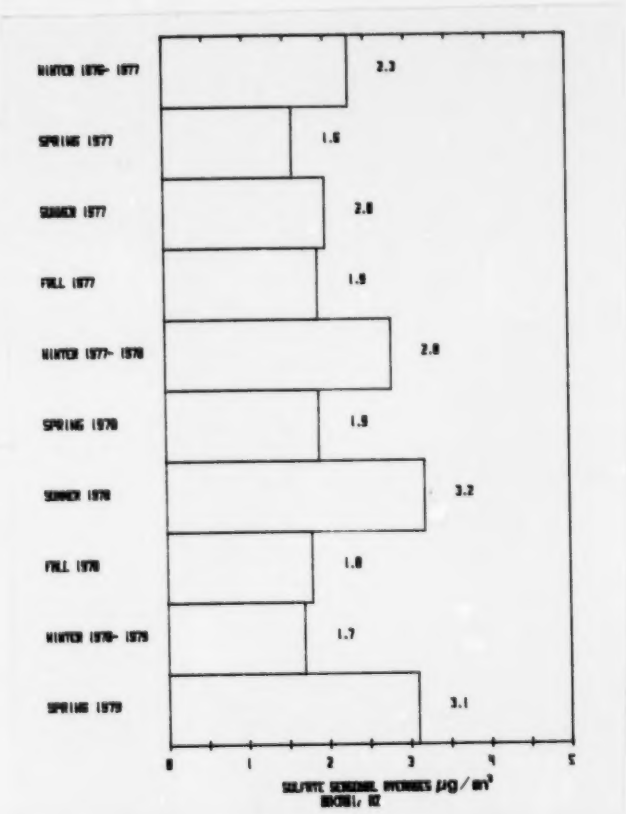


Figure 33. Sulfate seasonal averages
Bacobi, AZ

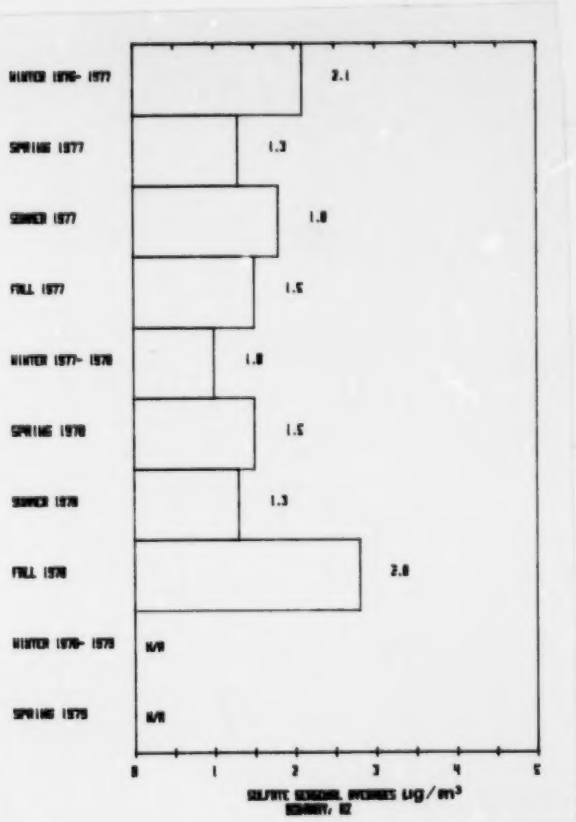


Figure 34. Sulfate seasonal averages
Bodaway, AZ

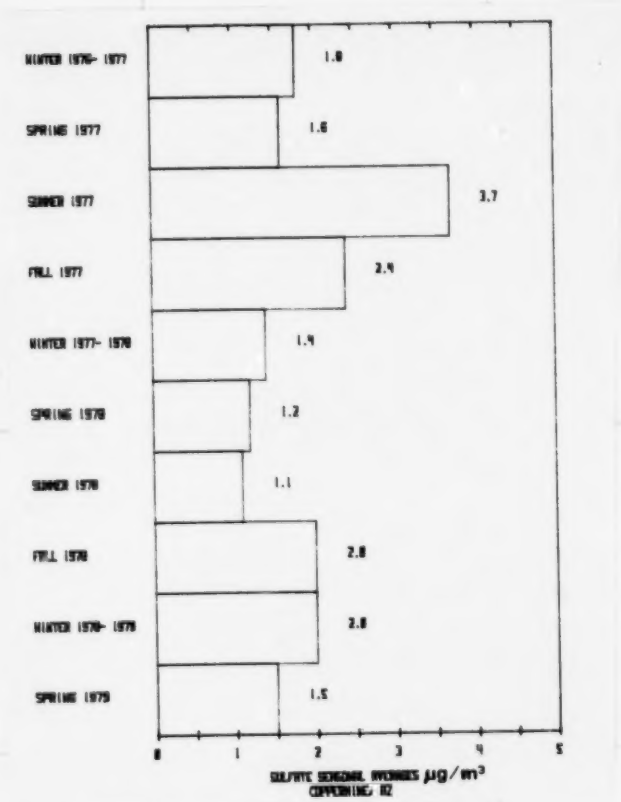


Figure 35. Sulfate seasonal averages Coppermine, AZ

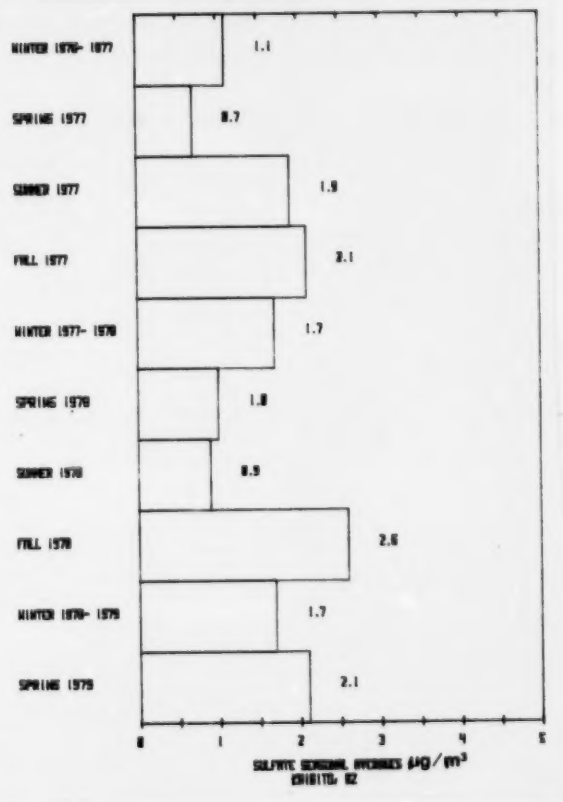


Figure 36. Sulfate seasonal averages Kaibito, AZ

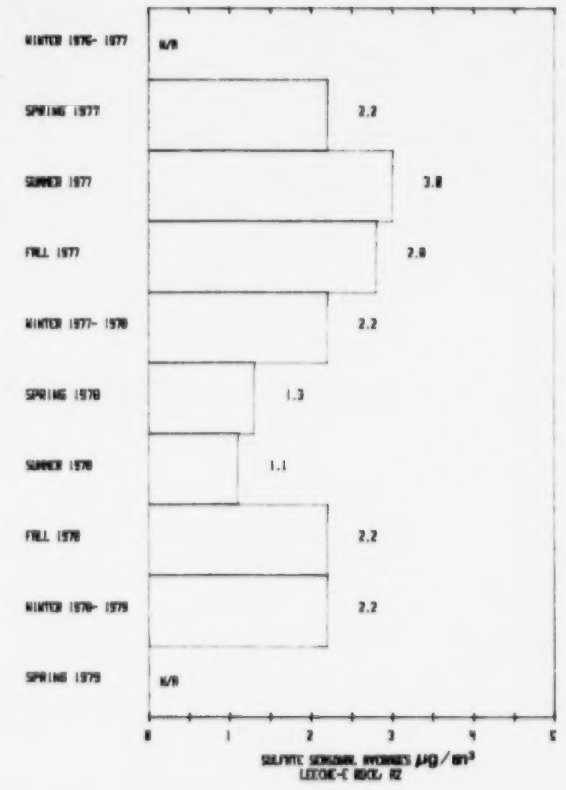


Figure 37. Sulfate seasonal averages Lechee, AZ

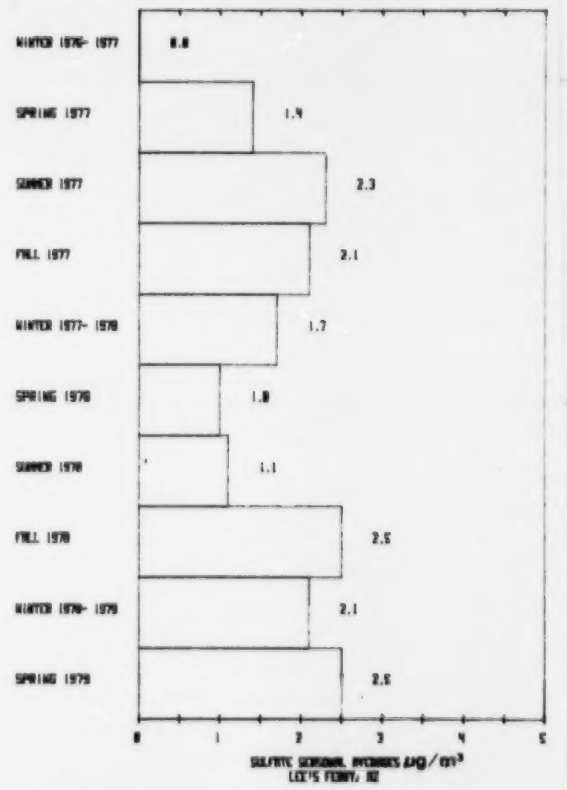


Figure 38. Sulfate seasonal averages Lee's Ferry, AZ

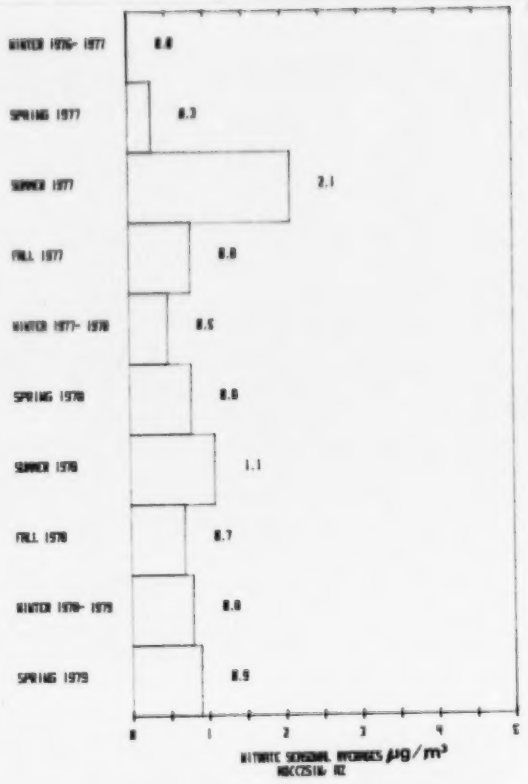


Figure 39. Sulfate seasonal averages Moccasin, AZ

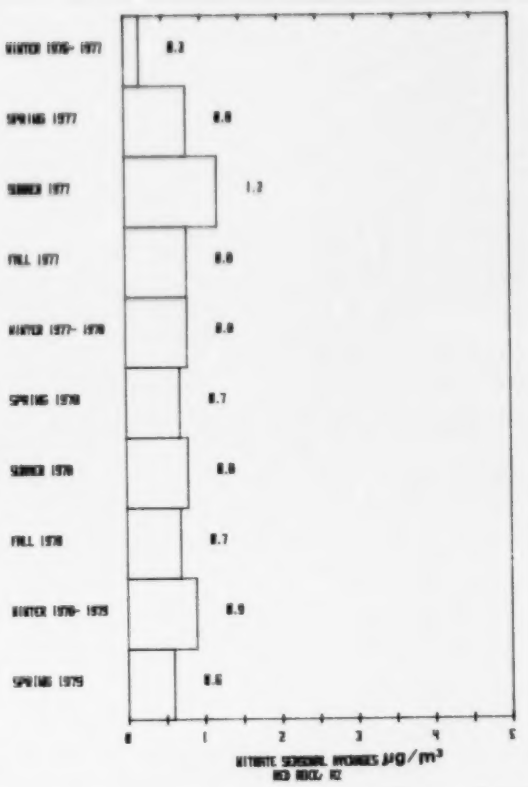


Figure 40. Sulfate seasonal averages Red Rock, AZ

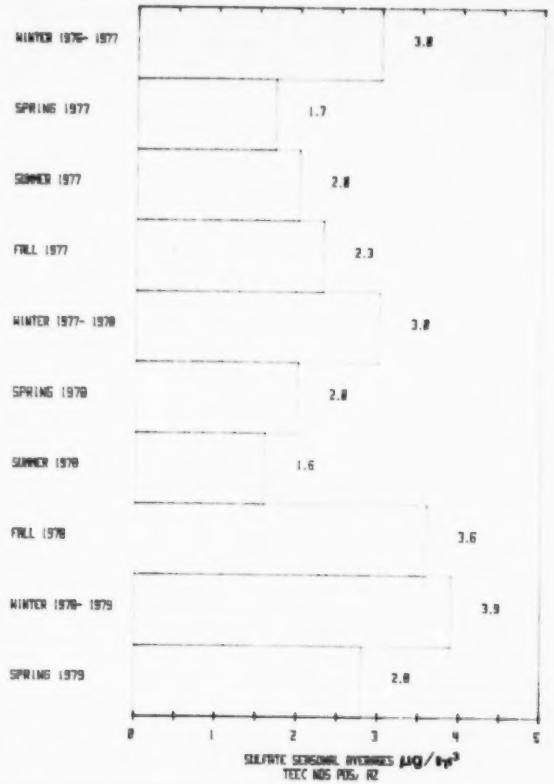


Figure 41. Sulfate seasonal averages
Teec Nos Pos, AZ

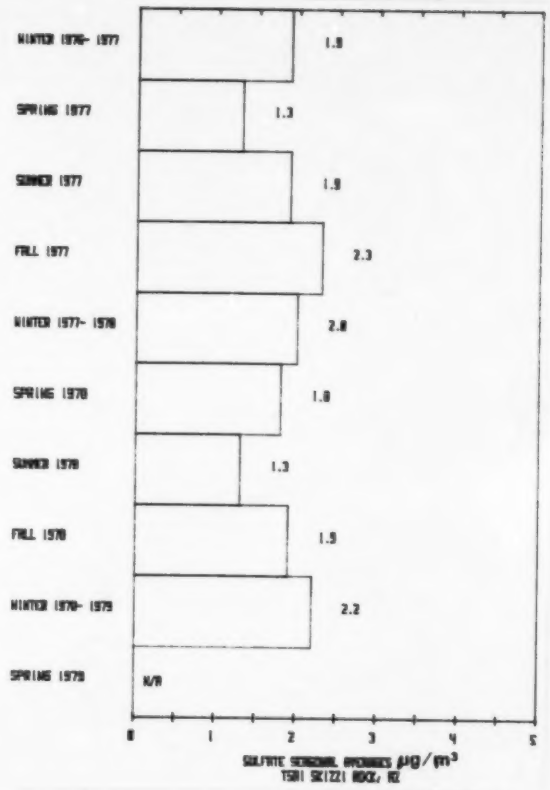


Figure 42. Sulfate seasonal averages
Tsa Schizzi, AZ

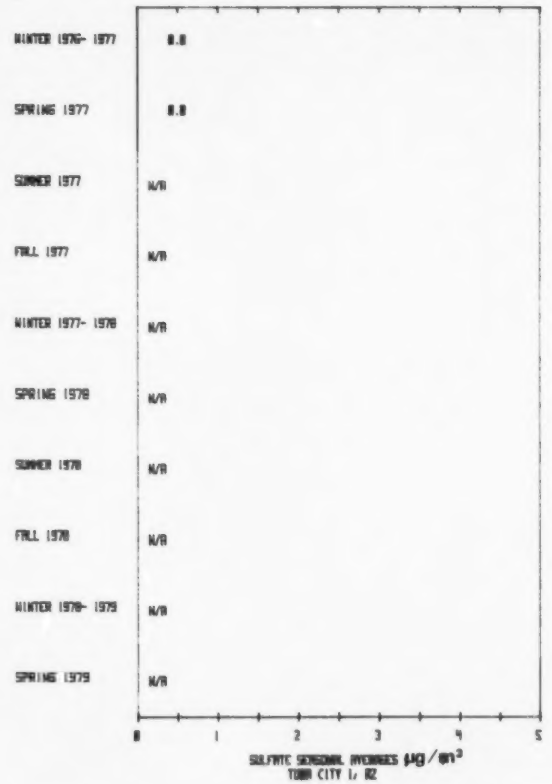


Figure 43. Sulfate seasonal averages Tuba City I, AZ

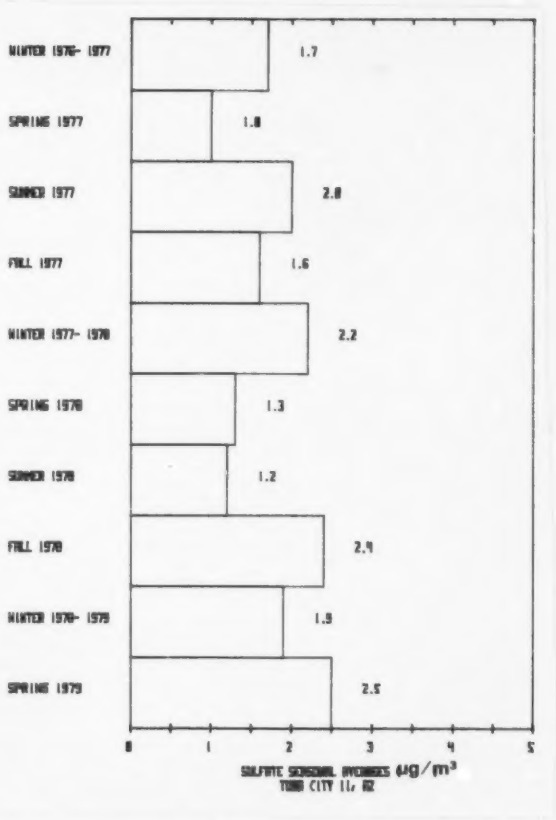


Figure 44. Sulfate seasonal averages Tuba City II, AZ

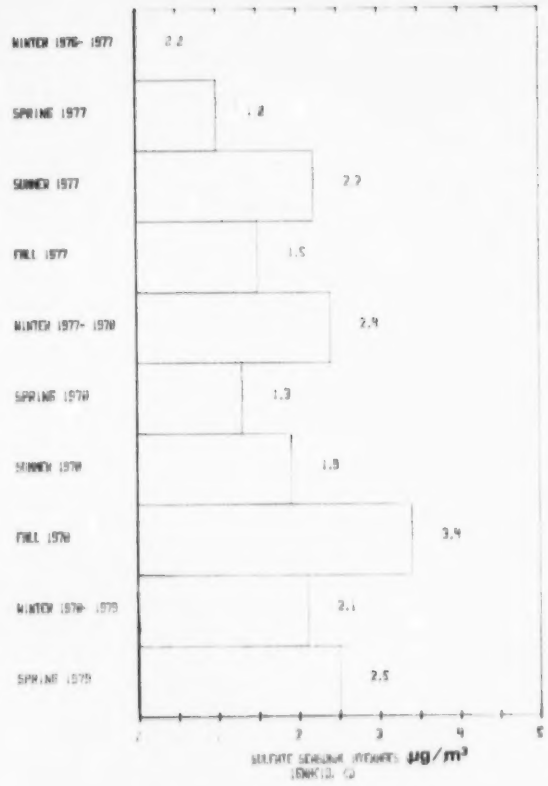


Figure 45. Sulfate seasonal averages Ignacio, CO

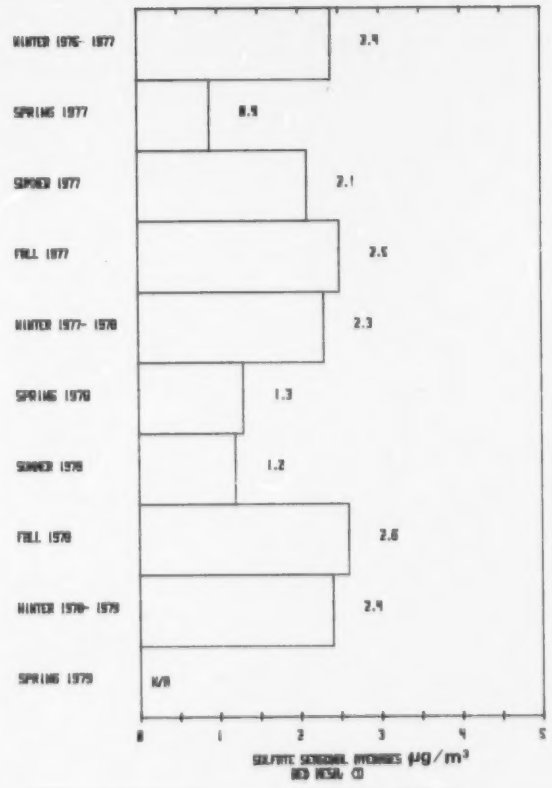


Figure 46. Sulfate seasonal averages Red Mesa, CO

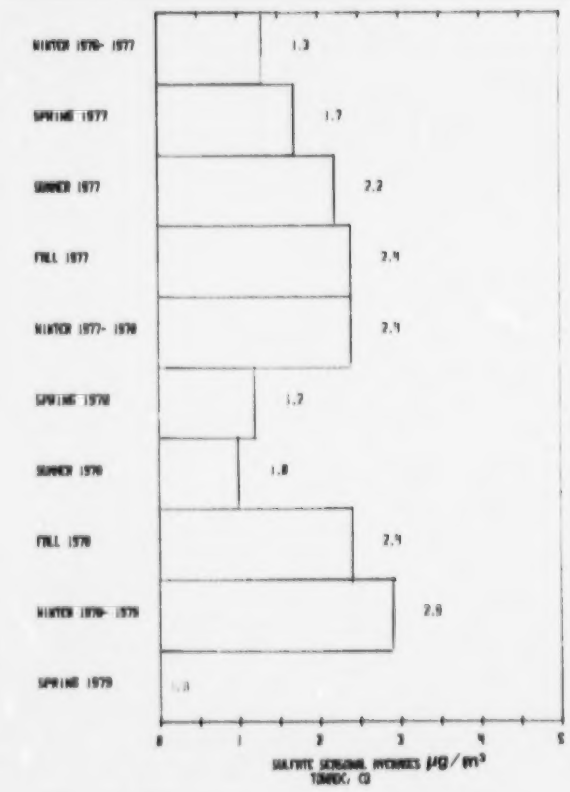


Figure 47. Sulfate seasonal averages
Towaoc, CO

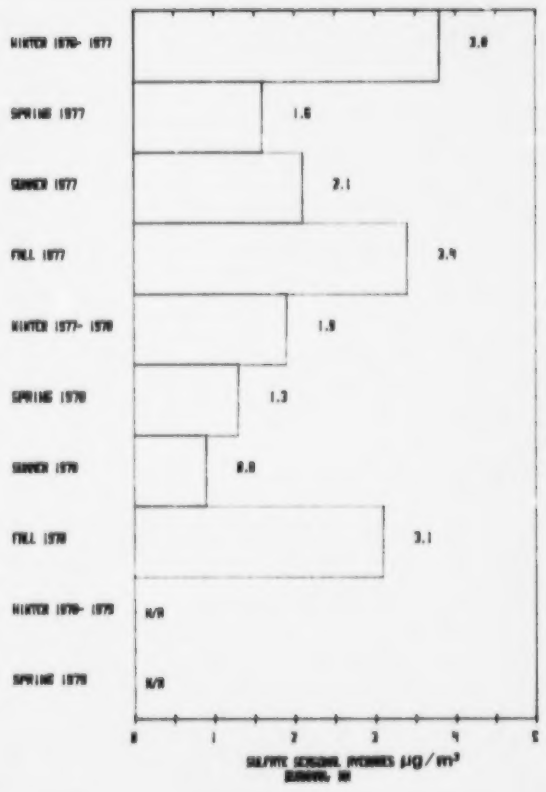


Figure 48. Sulfate seasonal averages
Burnham, NM

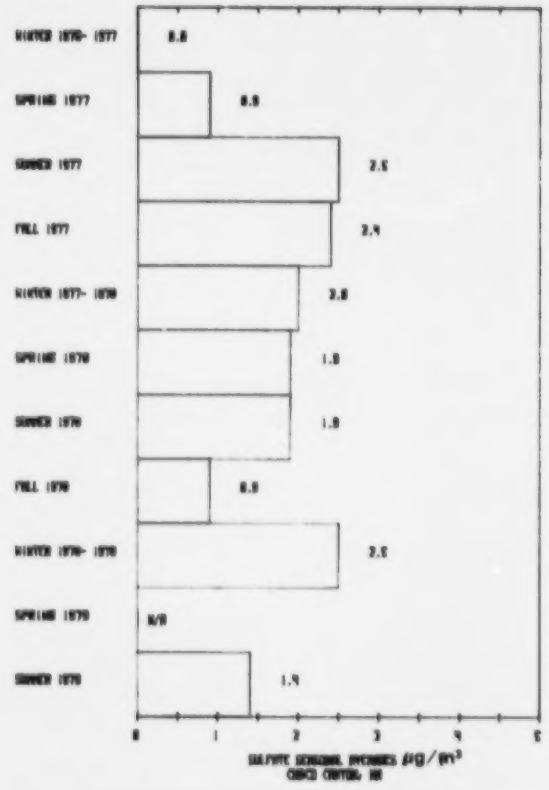


Figure 49. Sulfate seasonal averages
Chaco Canyon, NM

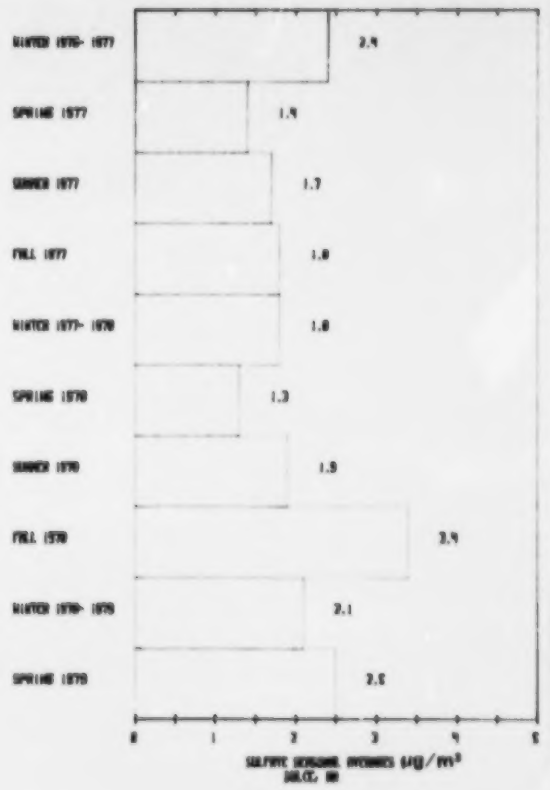


Figure 50. Sulfate seasonal averages
Dulce, NM

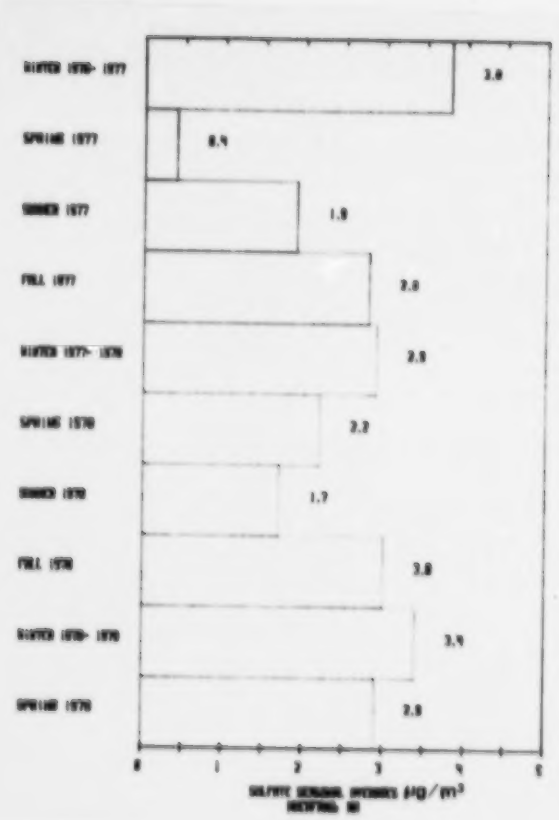


Figure 51. Sulfate seasonal averages
Huerfano, NM

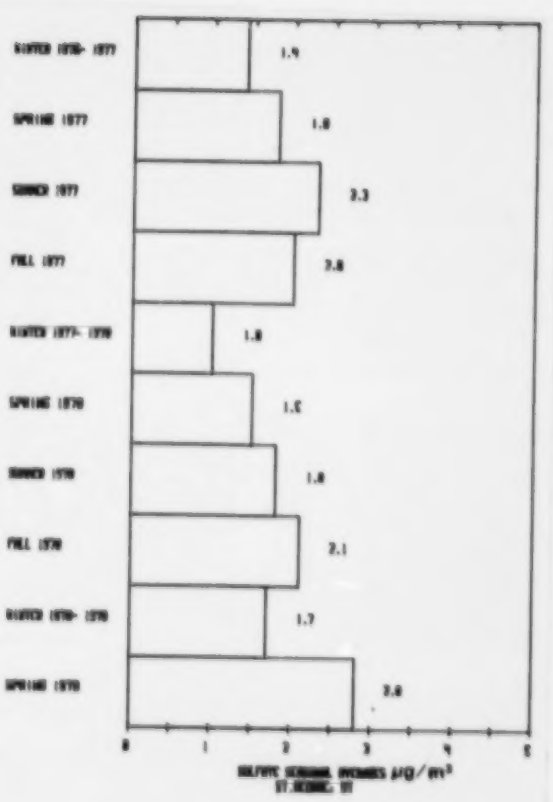


Figure 52. Sulfate seasonal averages
St. George, UT

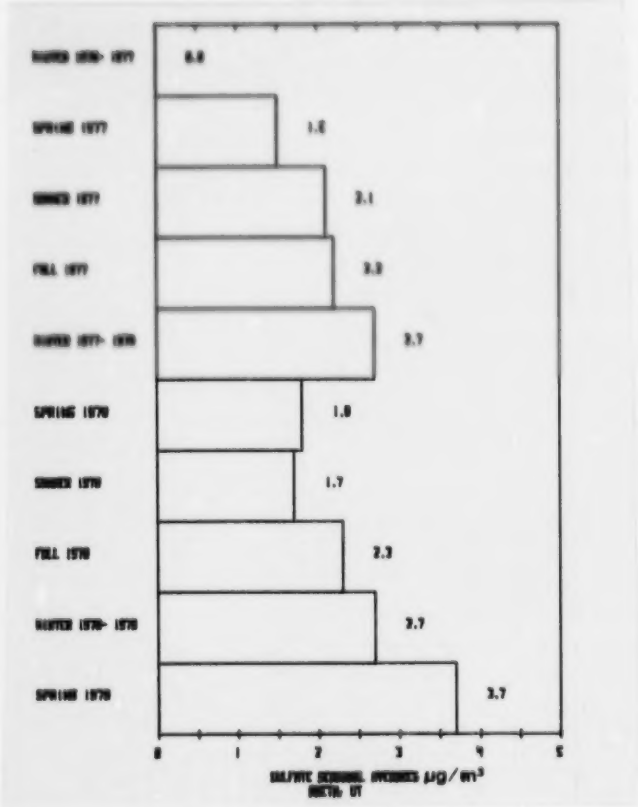


Figure 53. Sulfate seasonal averages Aneth, UT

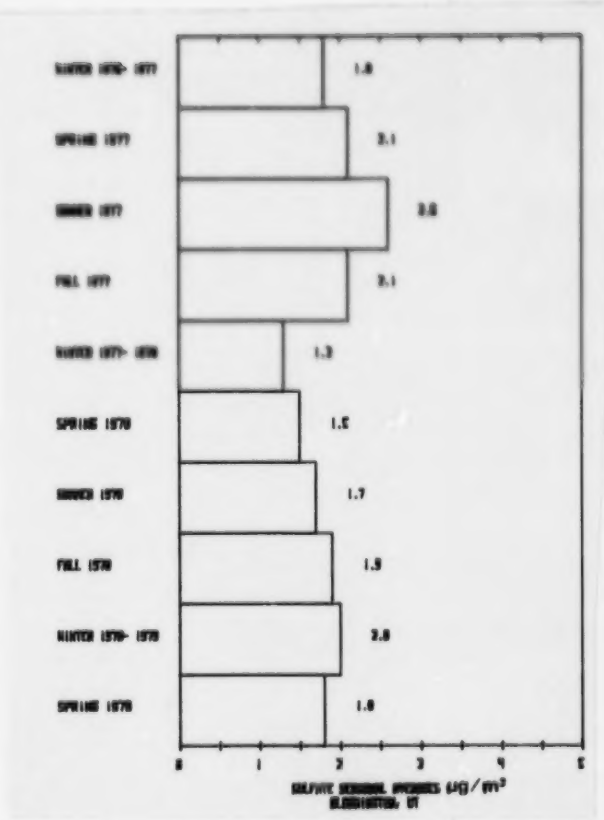


Figure 54. Sulfate seasonal averages Bloomington, UT

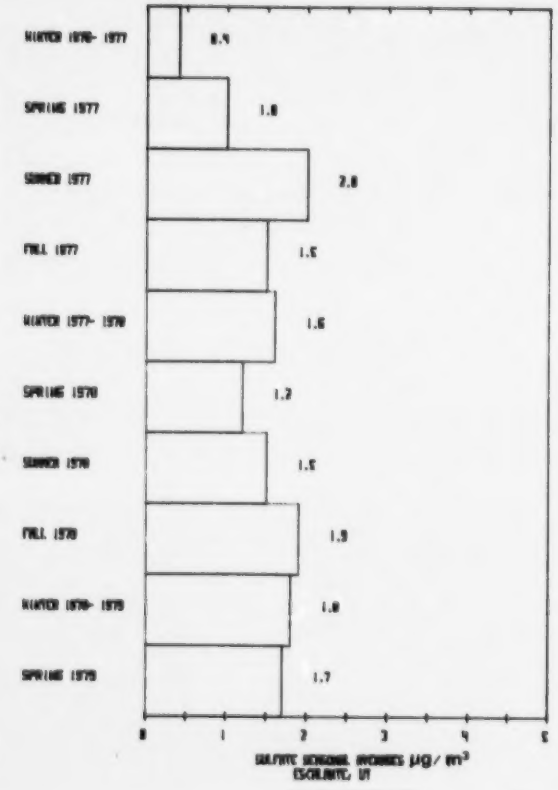


Figure 55. Sulfate seasonal averages
Escalante, UT

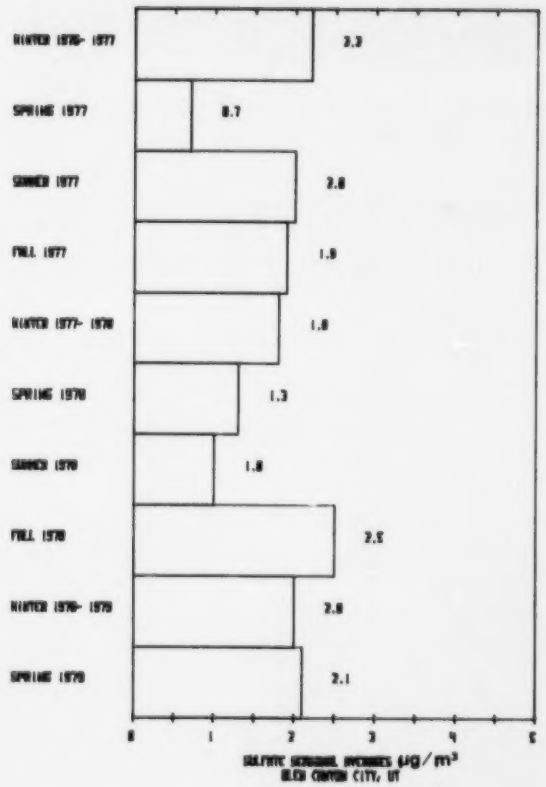


Figure 56. Sulfate seasonal averages
Glen Canyon, UT

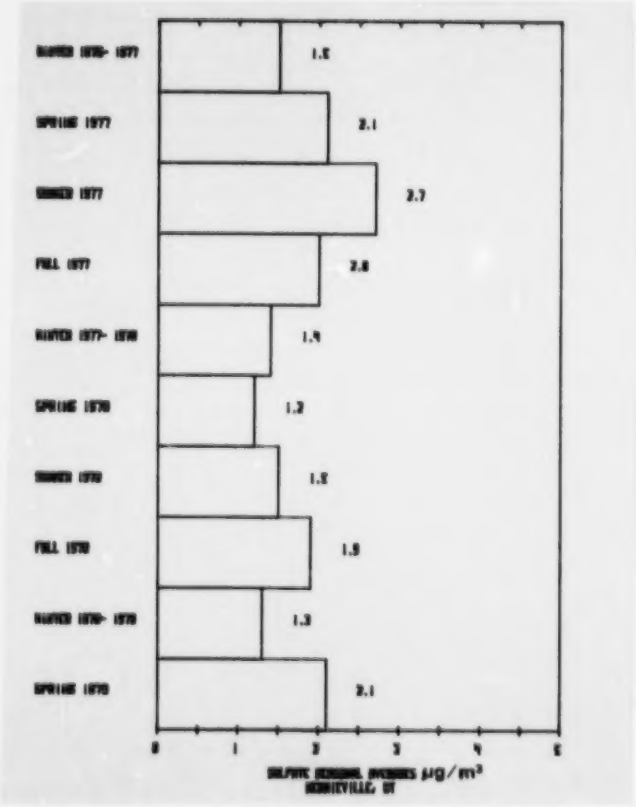


Figure 57. Sulfate seasonal averages
Henrieville, UT

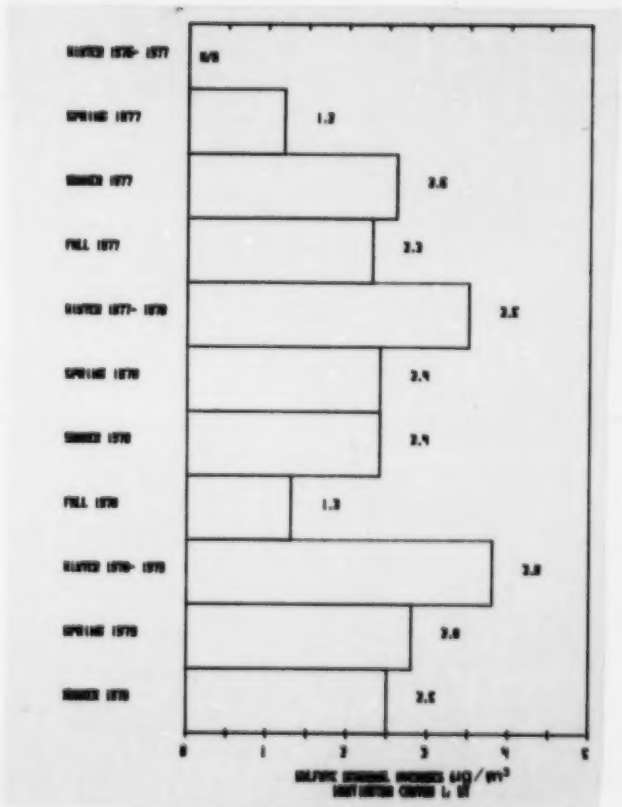


Figure 58. Sulfate seasonal averages
Huntington Canyon #1, UT

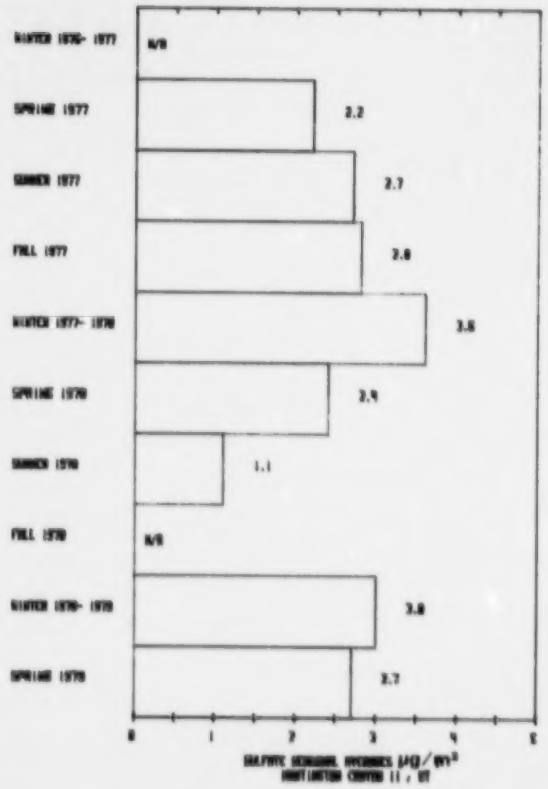


Figure 59. Sulfate seasonal averages
Huntington Canyon #2, UT

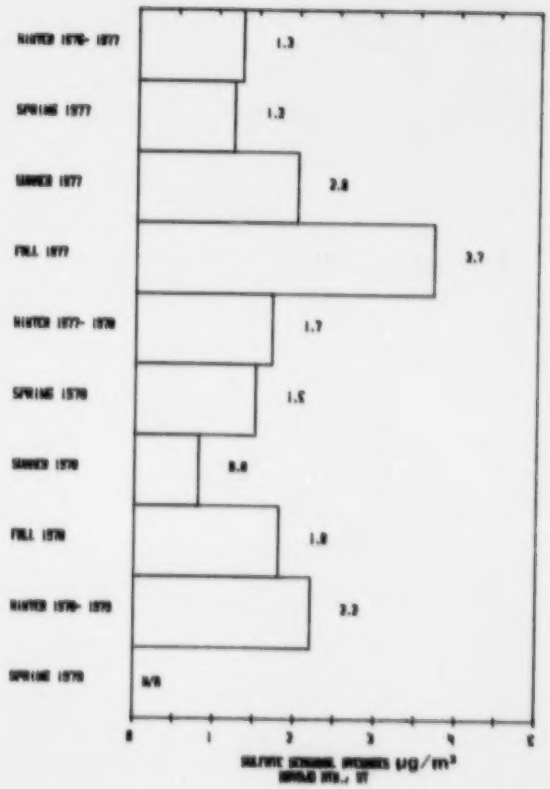


Figure 60. Sulfate seasonal averages
Navajo Mountain, UT

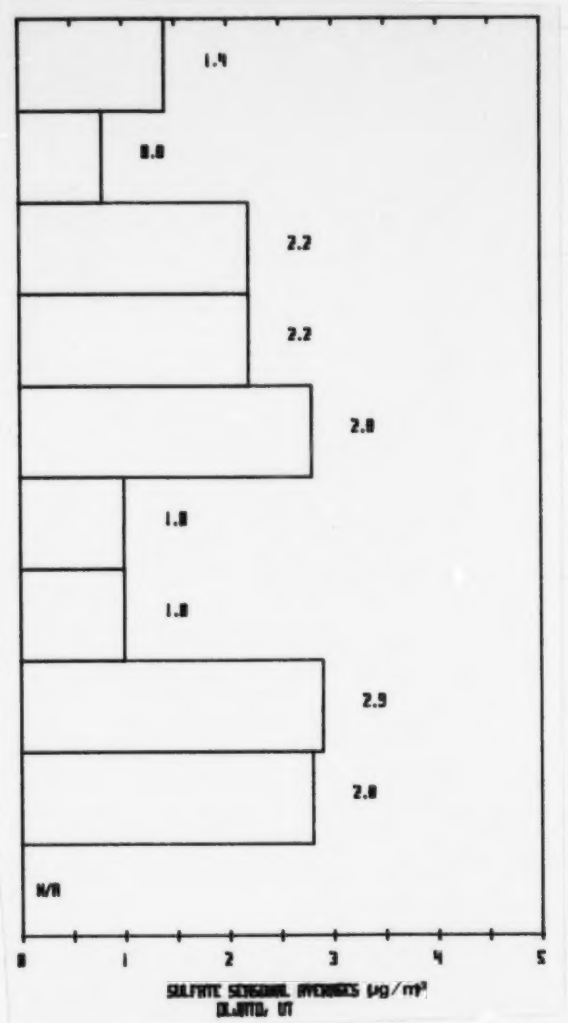


Figure 61. Sulfate seasonal averages Oljato, UT

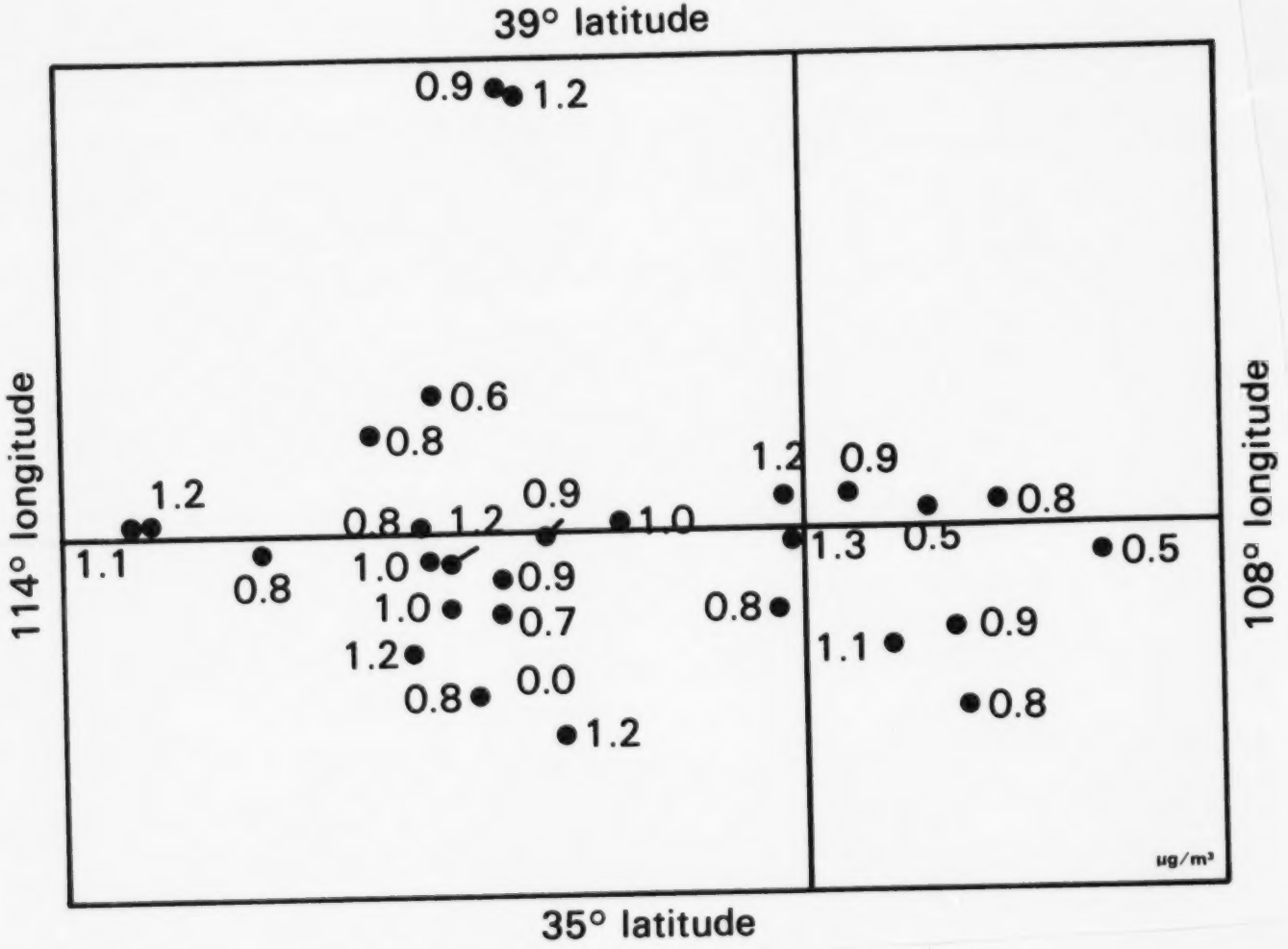


Figure 62. Summary Nitrates

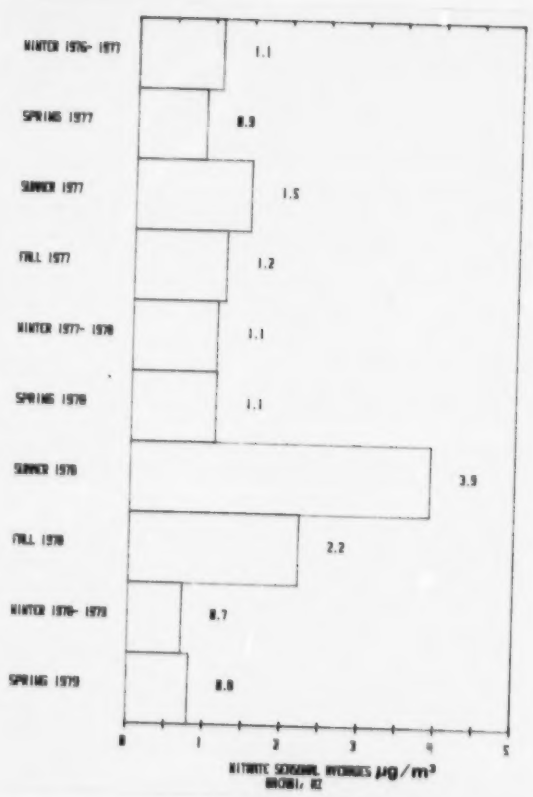


Figure 63. Nitrate seasonal averages Bacobi, AZ

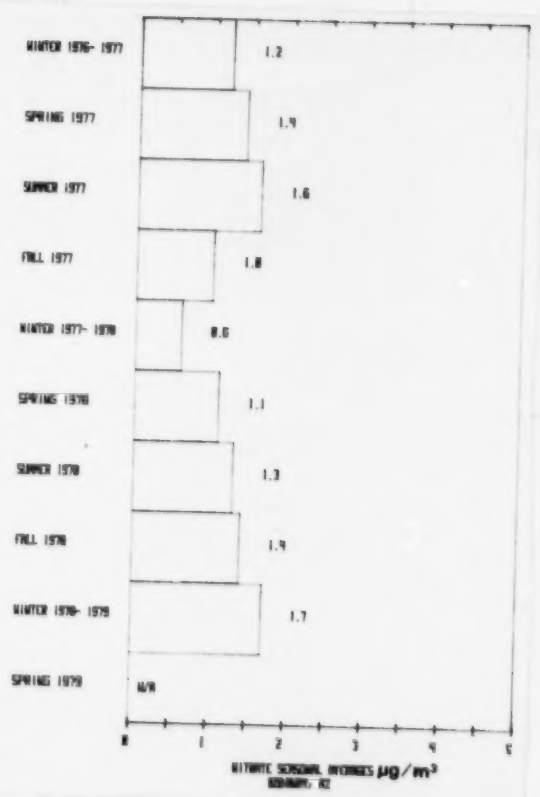


Figure 64. Nitrate seasonal averages Bodaway, AZ

Figure 65. Nitrate seasonal averages Coppermine, AZ

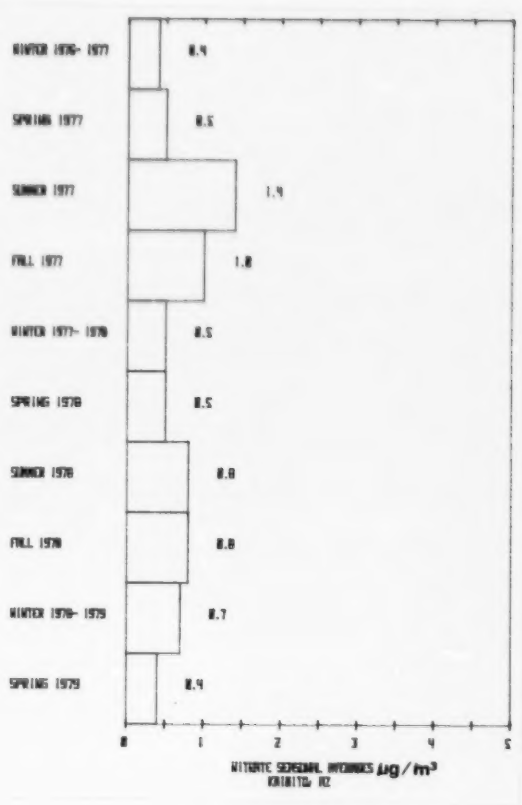


Figure 66. Nitrate seasonal averages Kaibito, AZ

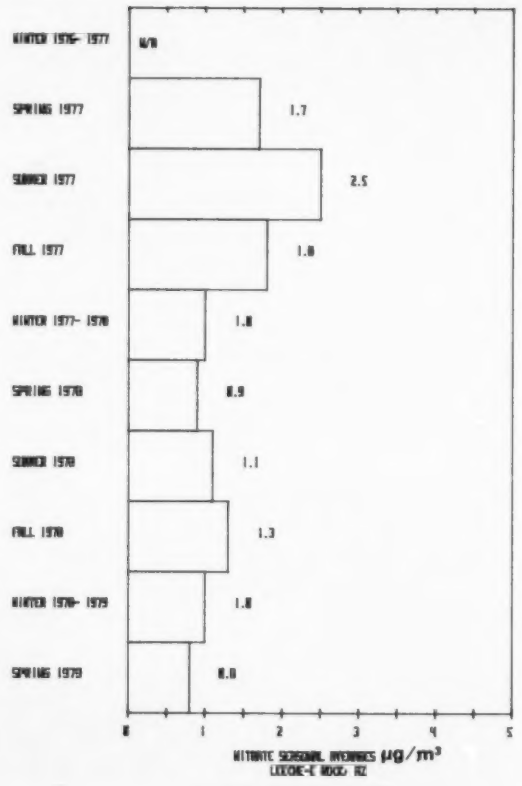


Figure 67. Nitrate seasonal averages Lechee, AZ

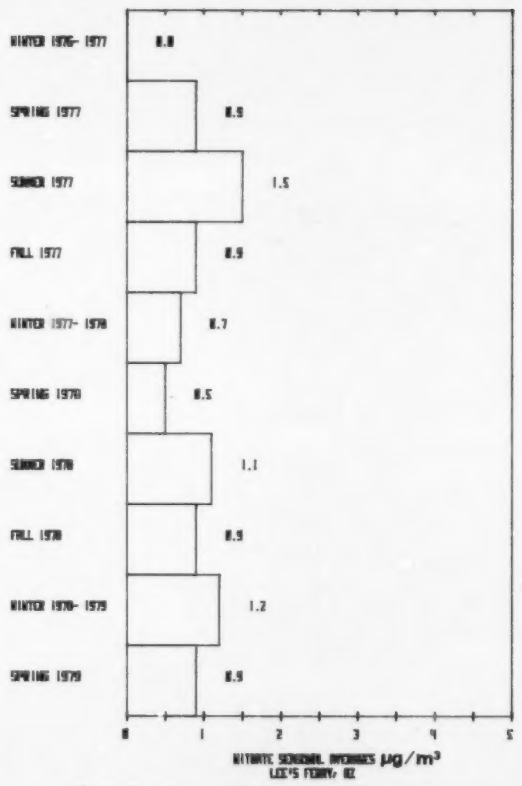


Figure 68. Nitrate seasonal averages Lee's Ferry, AZ

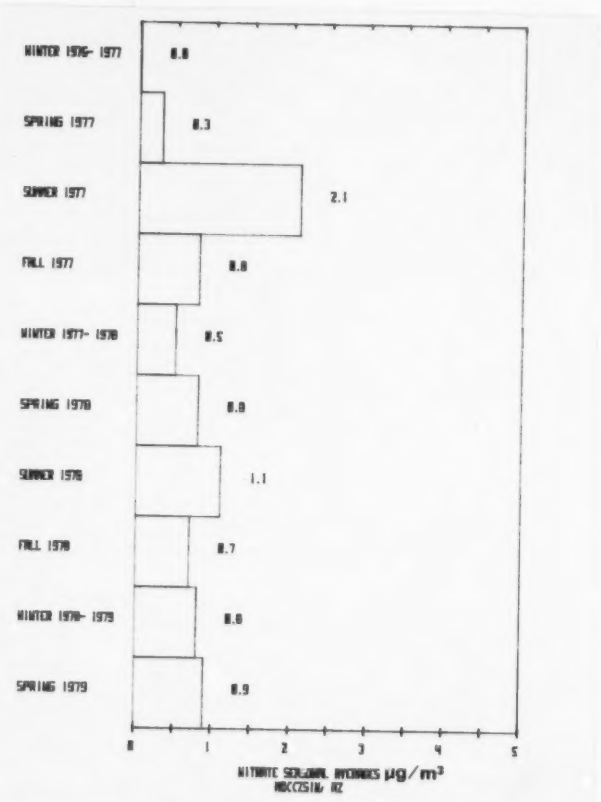


Figure 69. Nitrate seasonal averages Moccasin, AZ

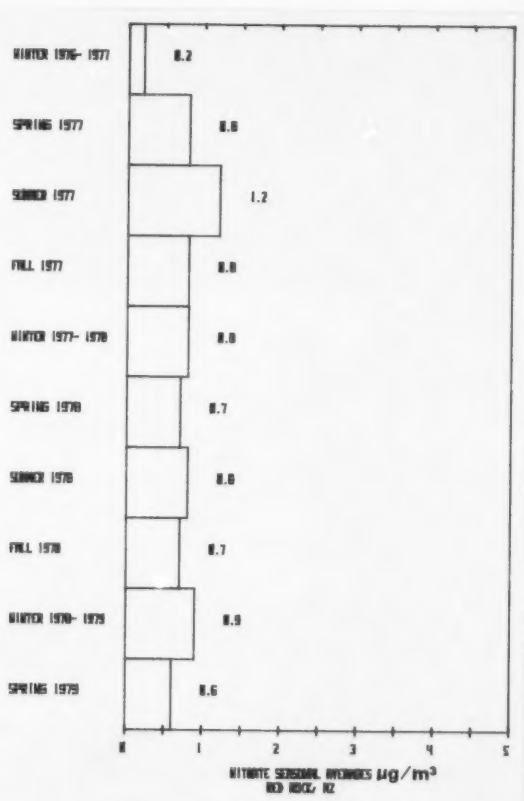


Figure 70. Nitrate seasonal averages Red Rock, AZ

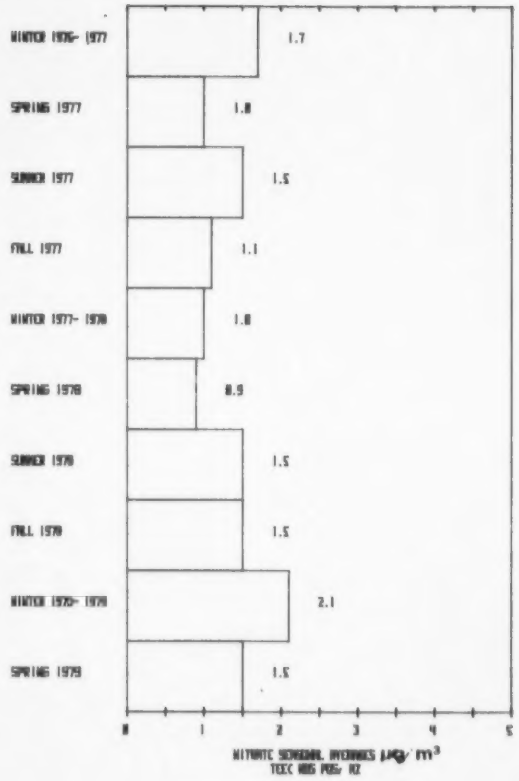


Figure 71. Nitrate seasonal averages
Teec Nos Pos, AZ

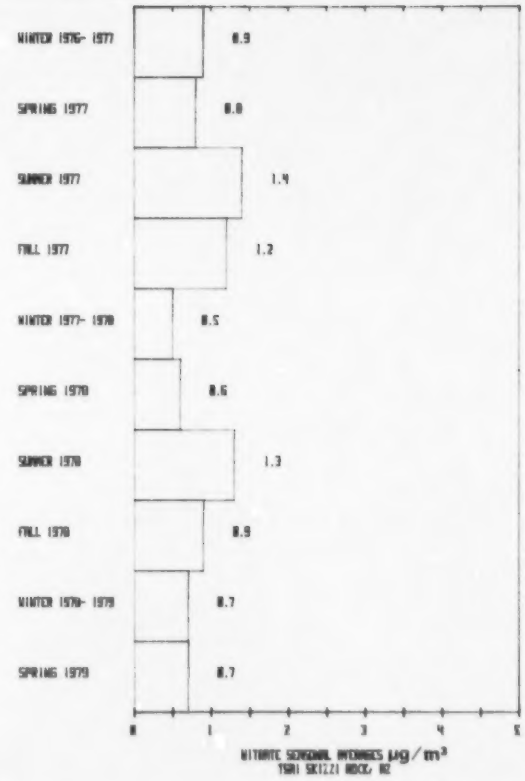


Figure 72. Nitrate seasonal averages
Tsa Schizzi, AZ

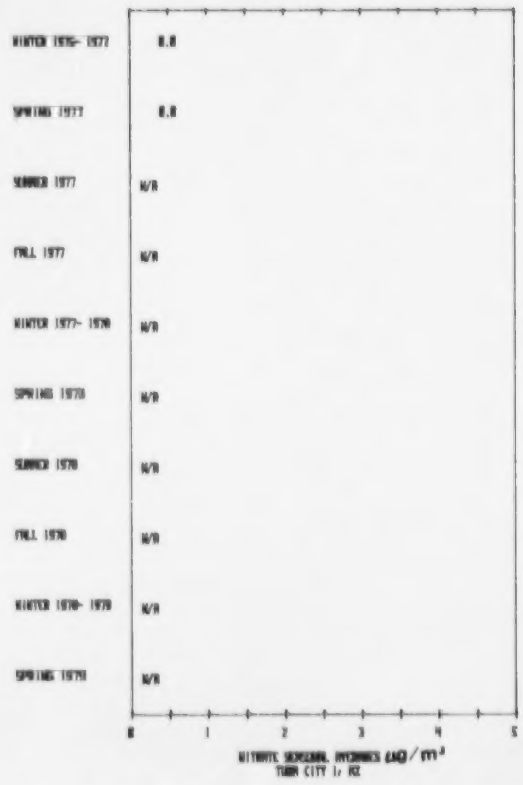


Figure 73. Nitrate seasonal averages
Tuba City I, AZ

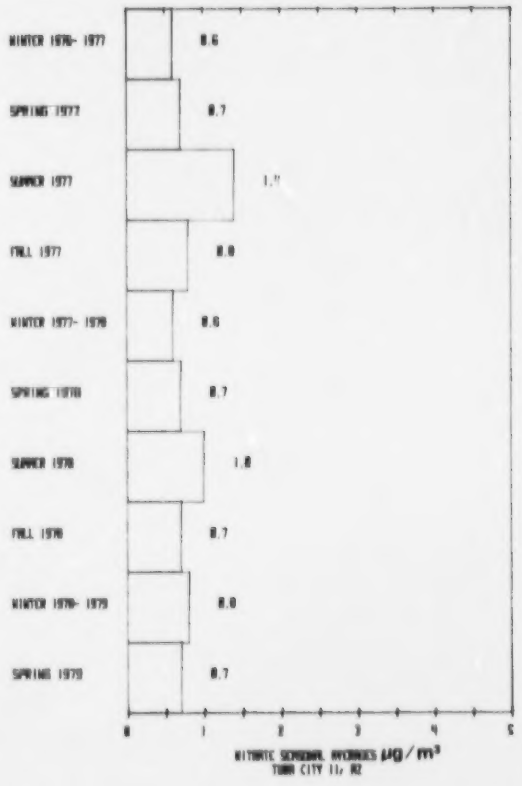


Figure 74. Nitrate seasonal averages
Tuba City II, AZ

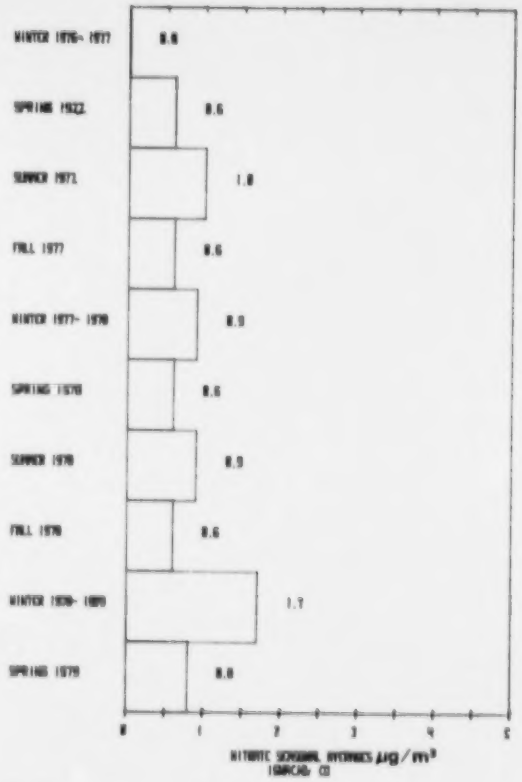


Figure 75. Nitrate seasonal averages
Ignacio, CO

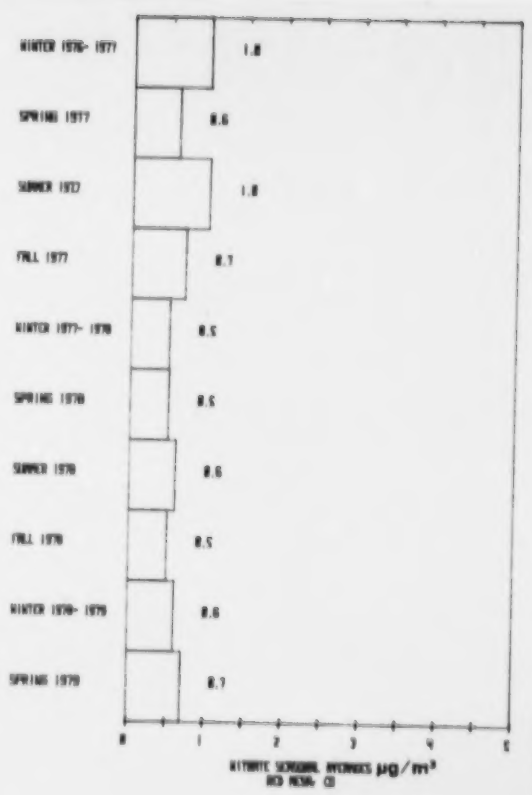


Figure 76. Nitrate seasonal averages
Red Mesa, CO

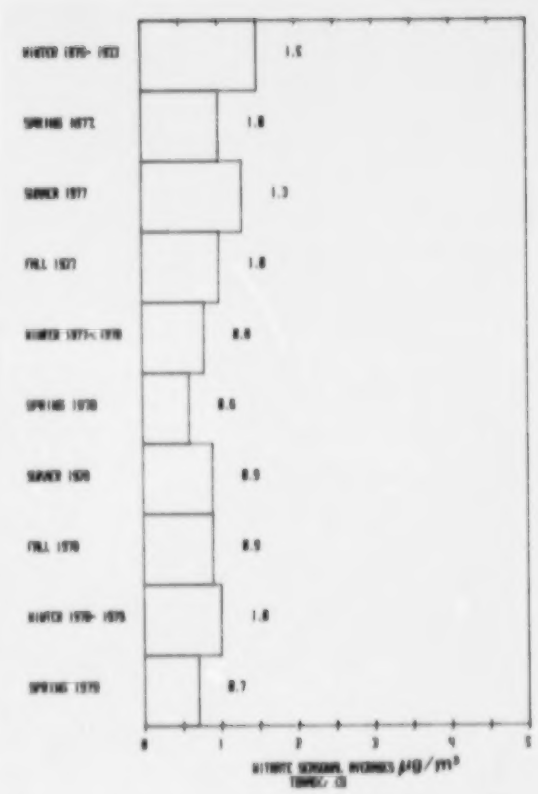


Figure 77. Nitrate seasonal averages
Towaoc, CO

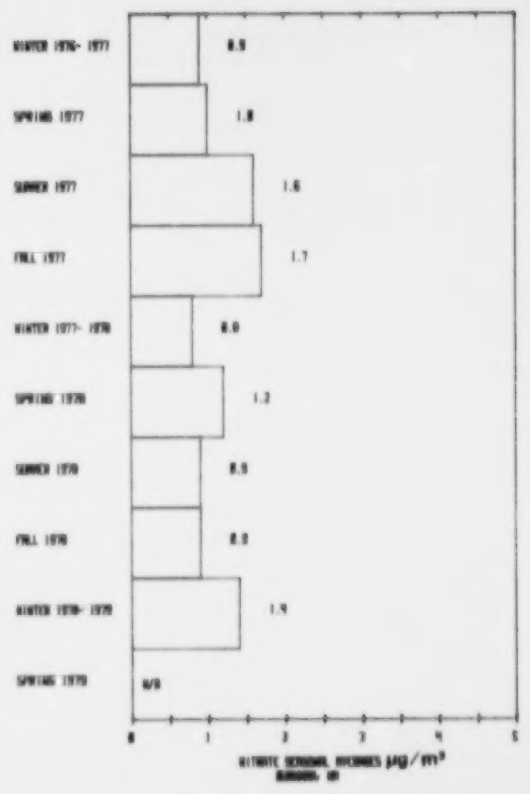


Figure 78. Nitrate seasonal averages
Burnham, NM

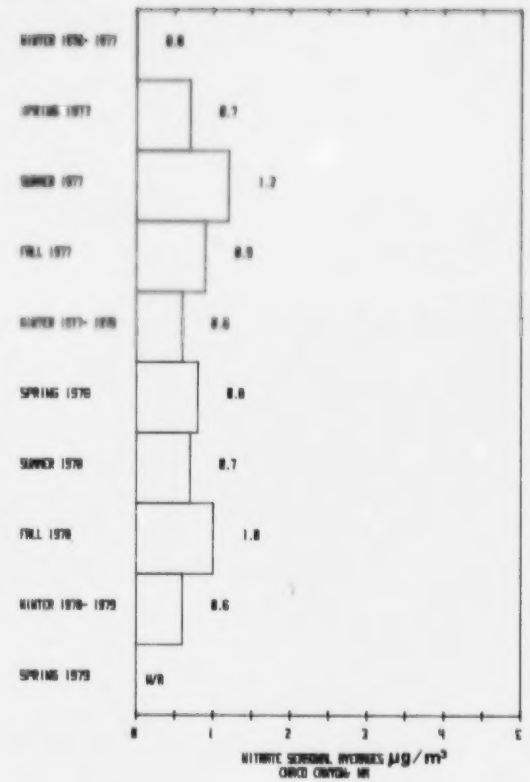


Figure 79. Nitrate seasonal averages
Chaco Canyon, NM

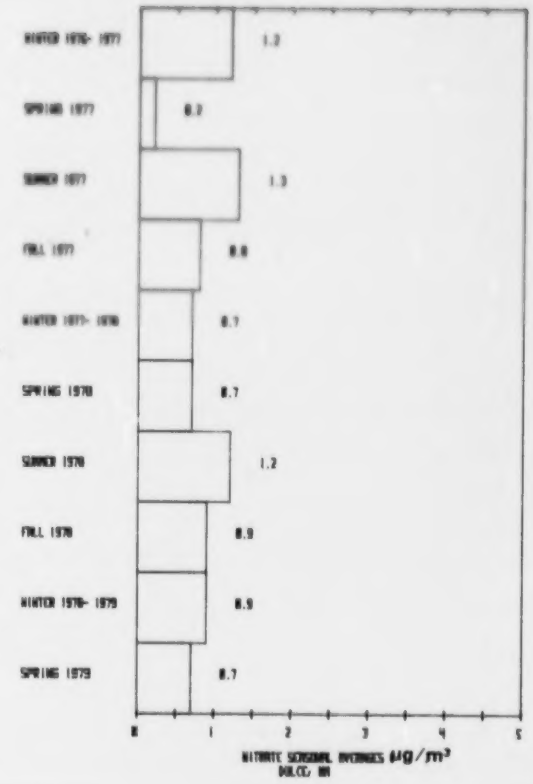


Figure 80. Nitrate seasonal averages
Dulce, NM

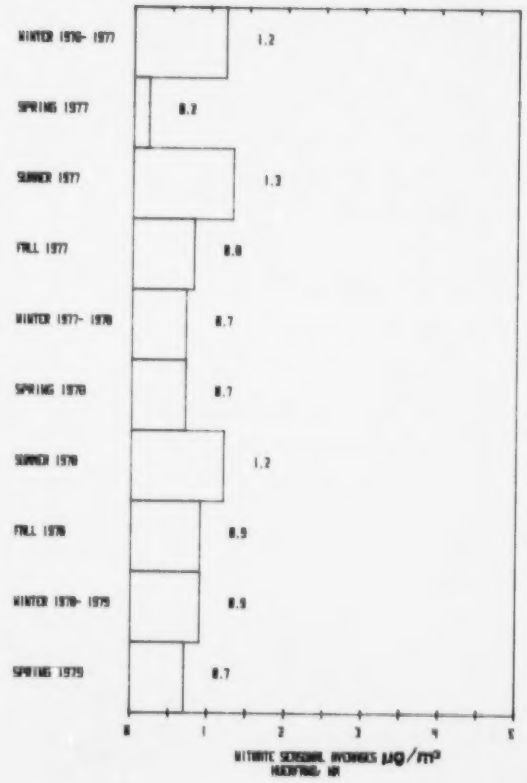


Figure 81. Nitrate seasonal averages
Huerfano, NM

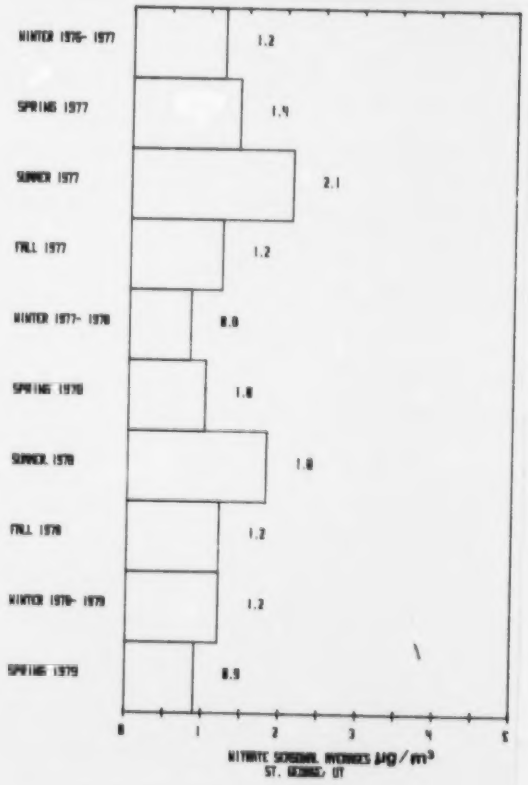


Figure 82. Nitrate seasonal averages
St. George, UT

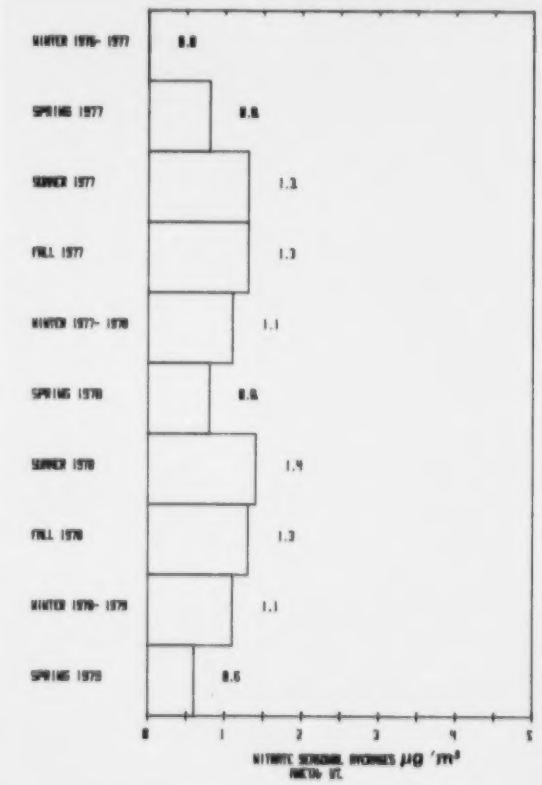


Figure 83. Nitrate seasonal averages Aneth, Ut

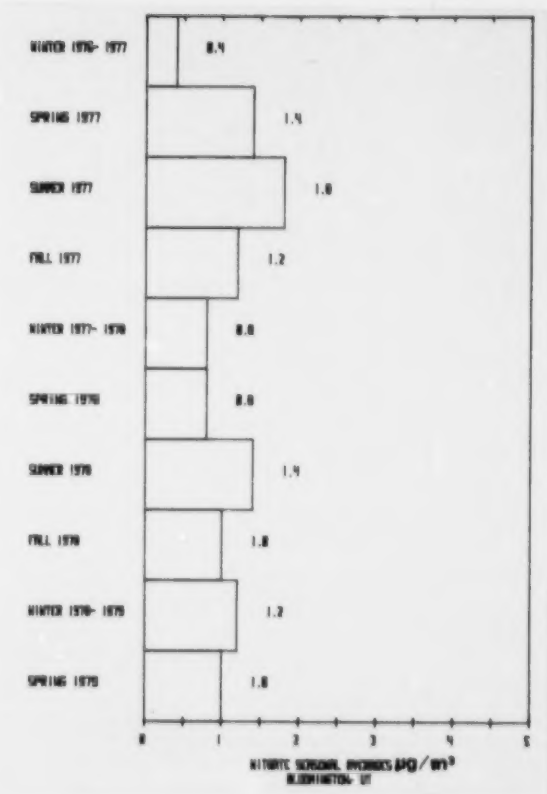


Figure 84. Nitrate seasonal averages Bloomington, UT

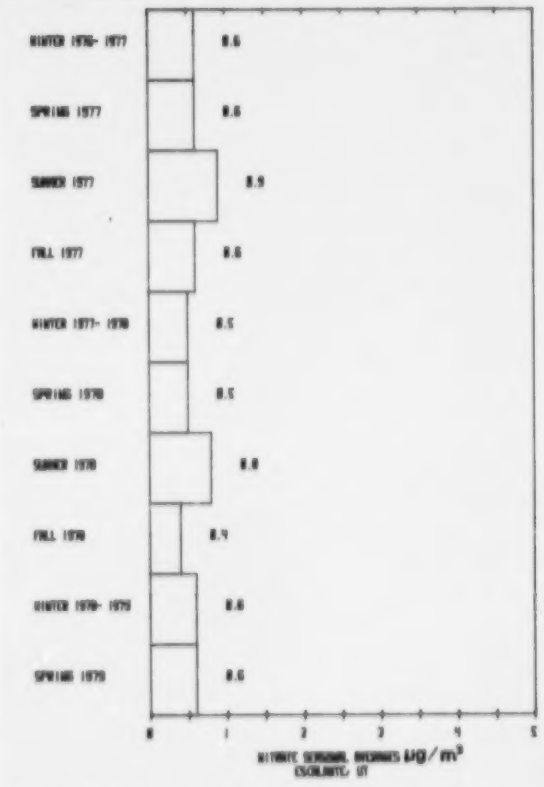


Figure 85. Nitrate seasonal averages
Escalante, UT

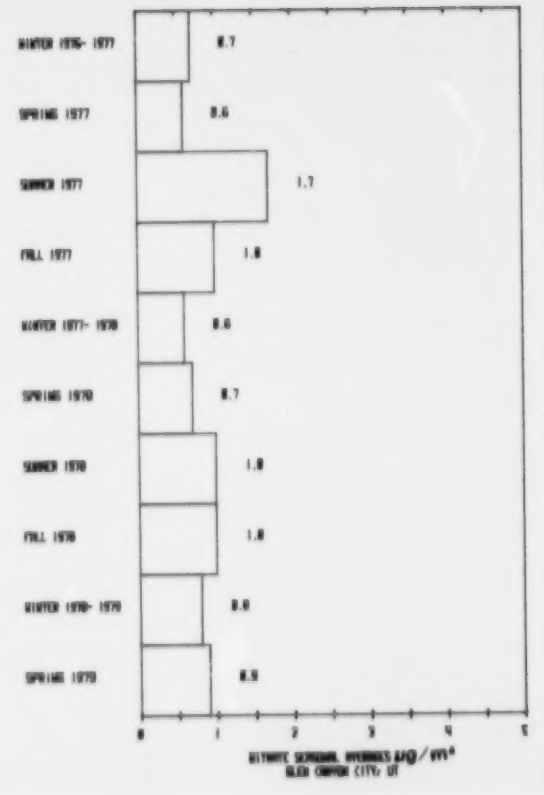


Figure 86. Nitrate seasonal averages
Glen Canyon, UT

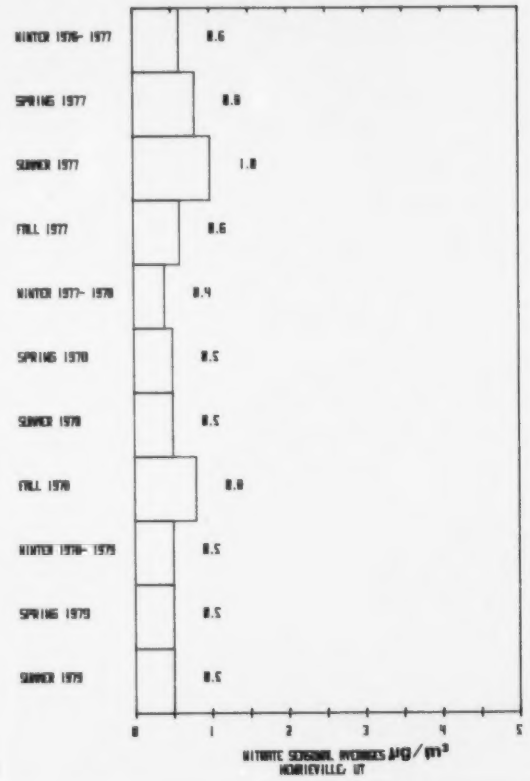


Figure 87. Nitrate seasonal averages Henrieville, UT

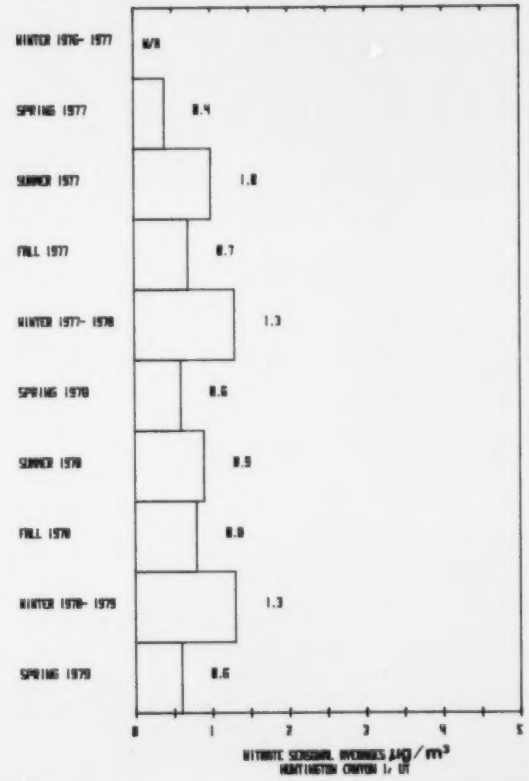


Figure 88. Nitrate seasonal averages Huntington Canyon #1, UT

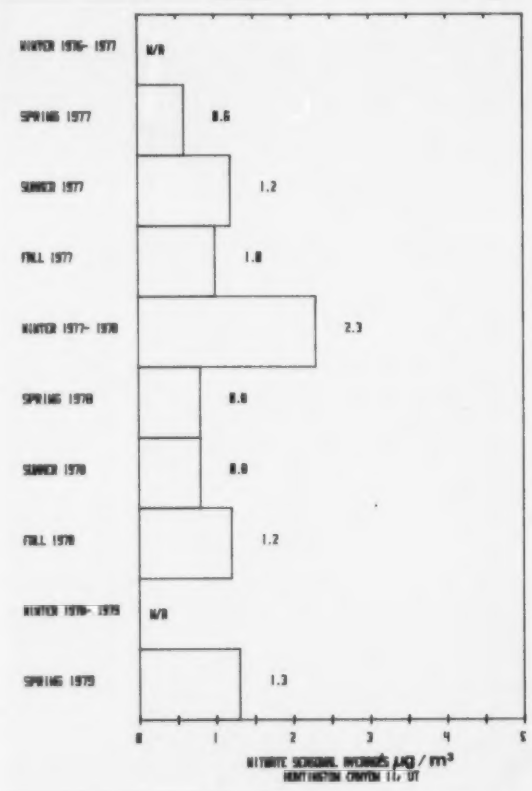


Figure 89. Nitrate seasonal averages
Huntington Canyon # 2, UT

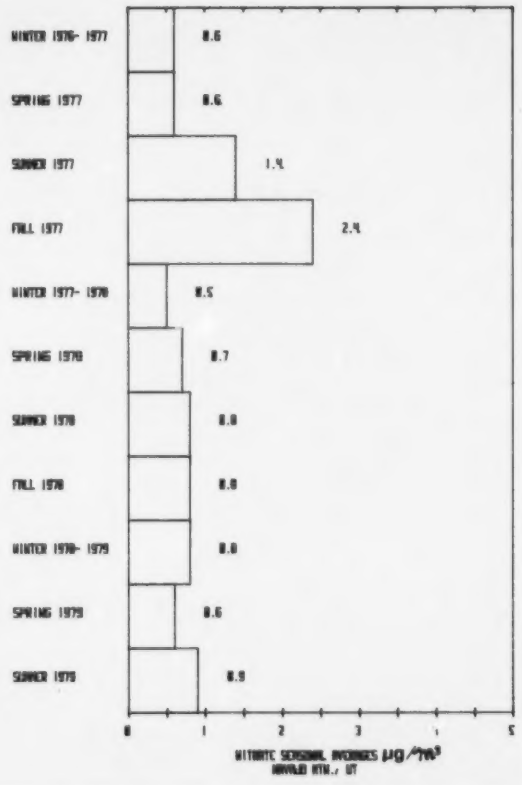


Figure 90. Nitrate seasonal averages
Navajo Mountain, UT

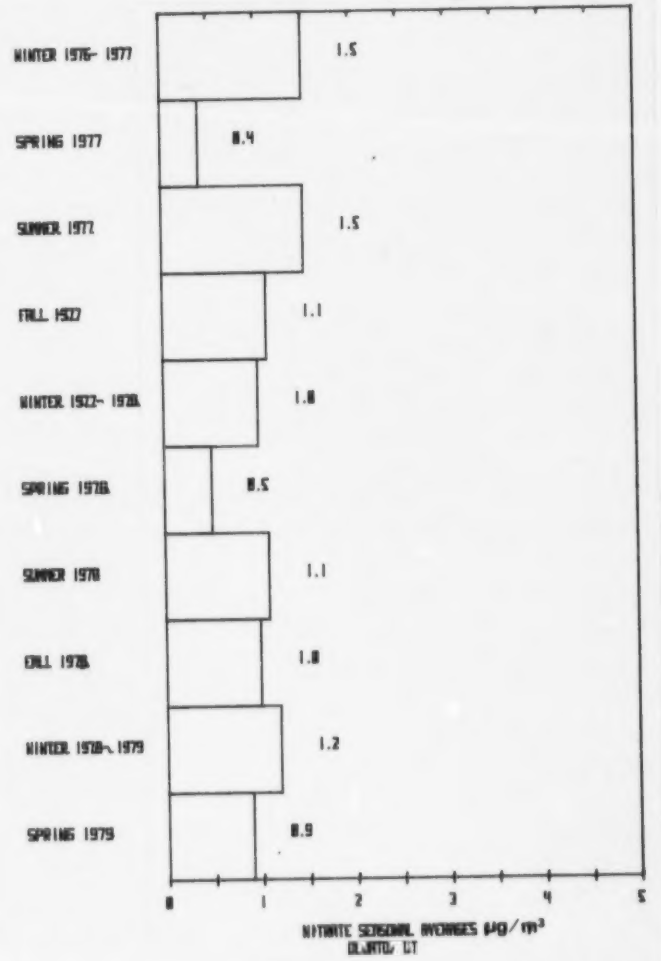


Figure 91. Nitrate seasonal averages
Oljato, UT

SOIL SAMPLING AND ANALYSES

Soil samples were collected from 21 of the URL FCN station sites. These samples were processed by first sieving the dried material through a 16-mesh then a 60-mesh screen. The resultant material was placed in a chamber and resuspended with a flow of air through a sintered glass disk. The particles were then accelerated and injected into clean air to achieve about a 100:1 dilution prior to sizing (Figure 92). A standard Lundgren impactor was used to size the ash into diameter ranges about 15 micron, 5 to 15 microns, 2 to 5 microns, 0.5 to 2 microns, and less than 0.5 microns.

All processed samples were analyzed by particle-induced x-ray emission (PIXE) for elements sodium and heavier. Cahill (1976) discusses the sensitivity and accuracy of this system. An 18-million electron volt alpha beam frm the 76-inch isochronous cyclotron, located at the University of California, Davis, excites x rays in the particulate sample. The characteristic x rays corresponding to a transition of any element, sodium and heavier, are converted to a digital signal processed by a PDP 15/40 computer. By evaluating the energy and total number of these x rays, the element is identified and a concentration is computed (Harrison 1973). The analytical system has been evaluated by various interlaboratory comparisons, achieving mean absolute accuracy of ±6 percent for aluminum and heavier (Camp 1975, 1978).

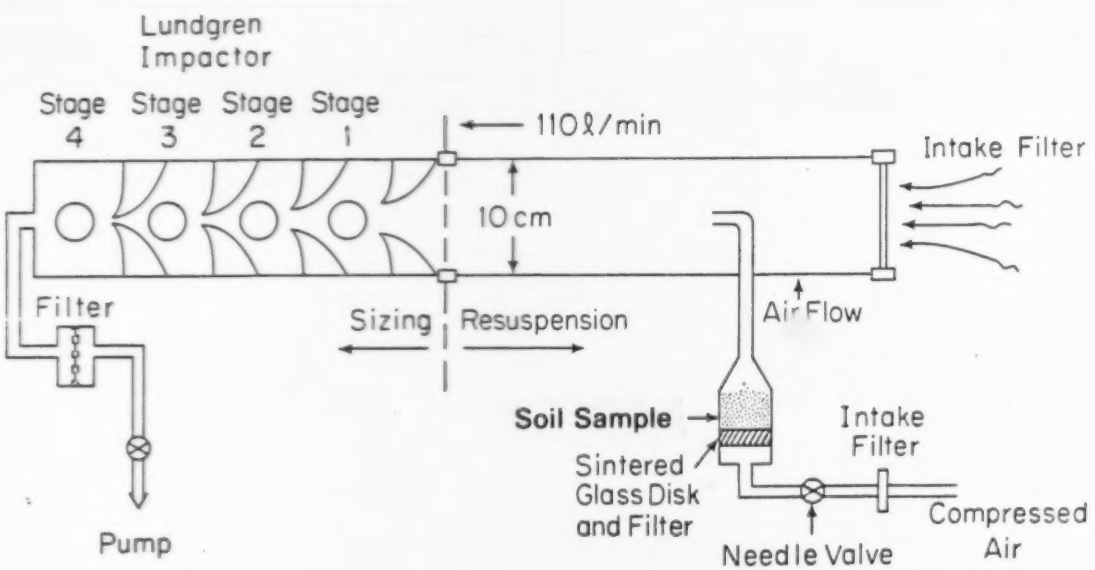


Figure 92. Soil Sample resuspension and sizing system (UC-Davis)

TABLE 4. PERCENT OF MEASURED ELEMENTS IN FCN SOIL SAMPLES

Site	Cr	Cu	Pb	Mn	Ni	Fe
Bacobi, AZ	0.0	0.0682	0.0	0.1352	0.0019	6.1572
Bodaway, AZ	0.0219	-	-	0.0851	-	-
Coppermine, AZ	5.5963	1.0460	0.0	9.8618	1.0450	0.0458
Kaibito, AZ	0.0	4.2855	0.0	8.4040	0.0	0.0153
Lechee, AZ	1.0598	1.0720	4.4798	1.1659	0.0	0.0376
Lee's Ferry, AZ	1.4221	0.0	0.0	5.2637	3.0509	0.0584
Tsa Schizzi, AZ	0.1390	0.0051	0.0035	0.0881	0.0	4.6199
Tuba City, AZ	5.5375	0.0	0.0	1.6229	0.0	0.0515
Ignacio, CO	0.0	0.1777	0.0038	0.1411	0.0011	6.5988
Red Mesa, CO	0.0	0.1183	0.0	0.1103	0.0	5.5744
Burnham, NM	0.0247	0.0166	0.0073	0.1716	0.0063	12.3107
Dulce, NM	0.0	0.1116	0.0	0.1234	0.0019	6.1134
Chaco Canyon, NM	0.0	0.0689	0.0	0.0404	0.0005	5.9519
Aneth, UT	0.0	0.0053	0.0062	0.1402	0.0032	5.0828
Bloomington, UT	0.0842	0.0756	0.0027	0.0628	0.0	4.1283
Escalante, UT	0.0	7.3751	0.0	6.3579	0.0	0.1456
Glen Canyon, UT	1.2299	0.0	1.1890	7.3672	4.1235	0.0467
Huntington #1, UT	0.0	7.5659	0.0	8.1881	0.0	0.0463
Navajo Mtn, UT	0.0118	0.0120	0.0	0.1475	0.0029	6.2611
Oljato, UT	0.0	0.0604	0.0742	0.1520	0.0	5.5373
St. George, UT	0.0102	0.0610	0.0801	0.1235	0.0	5.7437

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APPENDIX A

THE FOUR CORNERS AMBIENT AIR MONITORING NETWORK STATIONS

This appendix contains descriptions and data summaries for each site in the Four Corners Ambient Air Monitoring Network. All stations are computed assuming a log-normal distribution of the data. When the value reported is below the minimum detectable limit, half the minimum detection limit is used in the computation.

A series of seasonal geometric means is presented for each site in terms of micrograms per cubic meter. Also, a set of table showing correlation coefficients for the non-zero values reported and the mumber of observations (data pairs) incorporated in each coefficient for the full period of record are provided for each station.

Bacobi, Arizona (SAROAD Site Number 030520003K03)

This station, located in the northwest corner of the Hopi Indian Reservation, is about 120 kilometers south of the Navajo Generating Station and about 40 km south of the Black Mesa Coal Mine, both of which constitute potential or actual stationary emission sources. There are few paved roads in the visinity. The small village of Bacobi (population about 200) is nearby. The terrain is generally flat, consisting of sandy soil with only sparse vegetation. The major commercial activity in this area is livestock grazing.

The station, operated by a field employee of URL, is equipped with a high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	61.3	NA	NA	.001	.004	.002	.053	.018	.008	.000	.001	.056
2/76	23.9	NA	NA	.001	.004	.003	.032	.031	.007	.001	.001	.290
3/76	17.7	NA	NA	.001	.003	.002	.037	.025	.006	.000	.001	.163
4/76	10.7	2.314	1.380	.001	.003	.002	.047	.022	.007	.000	.001	.073
1/77	12.2	1.958	.637	.001	.003	.002	.043	.024	.009	.000	.001	.042
2/77	30.1	2.075	1.316	.001	.003	.002	.023	.030	.008	.001	.001	.013
3/77	17.0	1.625	1.105	.001	.004	.003	.065	.023	.007	.001	.003	.118
4/77	27.9	2.161	.985	.001	.005	.002	.114	.021	.008	.001	.002	.200
1/78	9.1	3.287	.846	.001	.003	.002	.150	.022	.006	.001	.001	.033
2/78	30.1	1.677	1.072	NA	NA	NA	.127	.028	.014	.001	NA	.250
3/78	29.9	2.960	1.765	NA	NA	NA	.088	.026	.014	.001	NA	.279
4/78	21.9	3.396	1.295	NA	NA	NA	.134	.046	.009	.001	NA	.039
1/79	5.5	1.716	.495	NA	NA	NA	.067	.022	.005	.001	NA	.003

Correlation Coefficients - Bacobi

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.86	0.08	0.31	0.89	-0.10	0.83	0.26	0.36
Al	-	1.00	0.12	0.50	0.90	0.02	0.94	0.35	0.54
Cu	-	-	1.00	0.15	0.08	0.49	0.08	0.27	0.27
Pb	-	-	-	1.00	0.22	0.17	0.21	0.41	0.36
Mn	-	-	-	-	1.00	-0.17	0.86	0.20	0.18
Ni	-	-	-	-	-	1.00	0.11	0.32	0.13
Fe	-	-	-	-	-	-	1.00	0.16	0.24
SO_4	-	-	-	-	-	-	-	1.00	0.62
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Bacobi

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	296	54	274	200	122	26	260	107	107
Al	-	54	52	45	32	10	45	42	42
Cu	-	-	274	198	116	25	243	101	101
Pb	-	-	-	200	102	22	182	79	79
Mn	-	-	-	-	122	19	119	49	49
Ni	-	-	-	-	-	26	23	15	15
Fe	-	-	-	-	-	-	260	91	91
SO_4	-	-	-	-	-	-	-	107	107
NO_3	-	-	-	-	-	-	-	-	107

Bodaway, Arizona (SAROAD Site Number 030200012K03)

This station, operated by a field employee of URL, is located in the western portion of the Navajo Indian Reservation near the Colorado River and the Grand Canyon National Park, about 56 km southwest of the Navajo Generating Station and 16 km east of the Cedar Ridge Trading Post on U.S. Highway 89. The terrain is predominantly flat. The sandy soil has many rock outcroppings and supports sparse vegetation. Livestock grazing is the only commercial activity. Highway 89, the only pave road in the vicinity, provides the only main access to the few scattered homes in the area. Powered with a propane electrical generator, the station is equipped with a single high volume air sampler and a flow recorder.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	75.0	NA	NA	.001	.003	.002	.032	.018	.006	.001	.001	.530
3/76	40.3	NA	NA	.001	.004	.002	.038	.020	.011	.001	.001	.529
4/76	14.0	NA	NA	.001	.003	.002	.031	.024	.008	.000	.001	.076
1/77	12.4	2.114	1.156	.001	.003	.002	.041	.029	.006	.000	.001	.092
2/77	36.5	1.340	1.400	.001	.003	.003	.008	.019	.009	.001	.001	.250
3/77	16.0	1.680	1.355	.001	.004	.002	.006	.023	.007	.001	.003	.202
4/77	12.9	1.219	.353	.001	.005	.002	.007	.027	.006	.000	.003	.085
1/78	7.3	1.241	.686	.001	.003	.002	.006	.032	.006	.001	.001	.025
2/78	21.3	1.420	1.057	NA	NA	NA	.005	.029	.012	.003	NA	.424
3/78	21.8	.932	.858	NA	NA	NA	.006	.019	.009	.001	NA	.148
4/78	14.5	2.645	1.328	NA	NA	NA	.007	.028	.007	.001	NA	.128

Correlation Coefficients - Bodaway

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.50	-0.05	-0.06	0.17	-0.14	0.29	0.25	0.52
Al	-	1.00	-0.07	0.46	0.66	0.23	0.60	-0.34	0.06
Cu	-	-	1.00	-0.17	-0.07	-0.01	-0.10	0.25	0.22
Pb	-	-	-	1.00	-0.09	-0.06	0.04	0.05	0.31
Mn	-	-	-	-	1.00	-0.24	-0.56	0.08	0.24
Ni	-	-	-	-	-	1.00	0.11	-0.38	-0.17
Fe	-	-	-	-	-	-	1.00	0.00	0.27
SO_4	-	-	-	-	-	-	-	1.00	0.64
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Bodaway

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	182	42	96	114	84	22	169	73	73
Al	-	42	6	32	31	11	41	35	35
Cu	-	-	96	60	45	8	95	15	15
Pb	-	-	-	114	64	19	110	51	51
Mn	-	-	-	-	84	13	83	34	34
Ni	-	-	-	-	-	22	21	15	15
Fe	-	-	-	-	-	-	169	68	68
SO_4	-	-	-	-	-	-	-	73	73
NO_3	-	-	-	-	-	-	-	-	73

Coppermine, Arizona (SAROAD Site Number 030200011K03)

This station is located in the western portion of the Navajo Indian Reservation about 40 km south of the Navajo Generating Station and 80 km northwest of the Black Mesa Coal Mine. The predominantly flat terrain has sandy soil, supporting only sparse vegetation for livestock grazing, the only commercial activity in the area. There are no paved roads within 16 km and a few, widely scattered homes and a trading post(about 1.6 km north of the station). An abandoned open-pit copper mine is located near the trading post.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	17.5	NA	NA	.001	.004	.004	.023	.020	.007	.001	.001	.098
2/76	26.8	NA	NA	.001	.003	.002	.020	.030	.007	.000	.001	.514
3/76	32.7	NA	NA	.001	.004	.002	.023	.025	.009	.001	.001	.317
4/76	13.9	NA	NA	.001	.004	.002	.020	.023	.007	.000	.001	.095
1/77	13.0	1.649	.633	.001	.003	.002	.025	.025	.006	.000	.001	.063
2/77	55.0	1.250	1.235	.001	.004	.002	.034	.026	.014	.001	.001	.286
3/77	39.2	3.620	2.483	.001	.004	.003	.081	.037	.013	.001	.002	.321
4/77	17.4	1.564	.478	.001	.006	.003	.062	.026	.008	.001	.002	.079
1/78	6.8	1.429	.423	.001	.003	.002	.063	.025	.006	.000	.001	.011
2/78	25.0	1.416	.905	NA	NA	NA	.038	.021	.014	.001	NA	.204
3/78	21.4	.682	.613	NA	NA	NA	.160	.025	.011	.001	NA	.097
4/78	15.5	2.737	.949	NA	NA	NA	.166	.031	.012	.001	NA	.044

Correlation Coefficients - Coppermine

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.74	0.01	0.04	0.73	-0.03	0.71	0.18	0.27
Al	-	1.00	0.02	0.44	0.71	0.06	0.82	0.25	0.41
Cu	-	-	1.00	0.19	0.07	0.20	0.07	0.32	0.06
Pb	-	-	-	1.00	0.11	0.33	0.06	0.17	0.38
Mn	-	-	-	-	1.00	-0.10	0.84	0.12	0.18
Ni	-	-	-	-	-	1.00	-0.10	0.36	0.34
Fe	-	-	-	-	-	-	1.00	0.12	0.25
SO_4	-	-	-	-	-	-	-	1.00	0.56
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Coppermine

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	275	68	254	186	142	36	242	125	125
Al	-	68	67	57	53	14	63	56	56
Cu	-	-	254	180	138	34	224	115	115
Pb	-	-	-	186	119	32	170	87	87
Mn	-	-	-	-	142	23	140	71	71
Ni	-	-	-	-	-	36	35	22	22
Fe	-	-	-	-	-	-	242	106	106
SO_4	-	-	-	-	-	-	-	125	125
NO_3	-	-	-	-	-	-	-	-	125

Kaibito, Arizona (SAROAD Site Number 939200010K03)

This station is located on the Navajo Indian Reservation about 56 km southeast of the Navajo Generating Station and 64 km northwest of the Black Mesa Coal Mine. The slightly hilly terrain has sandy soil, supporting sparse

vegetation used for livestock grazing. Except for a paved highway about 1.6 km from the station, all roads in the area are dirt, providing access to a trading post and small tribal buildings about 0.8 km east of the station and to several homes and a school about 0.8 km west of the station.

The station, operated by a field employee of URL, is equipped with a single volume air sampler and a flow recorder, with commercial electrical power available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	34.0	NA	NA	.001	.004	.004	.030	.022	.005	.002	.001	.128
2/76	47.9	NA	NA	.001	.003	.003	.022	.035	.009	.001	.001	.335
3/76	40.1	NA	NA	.001	.003	.002	.015	.025	.010	.000	.001	.333
4/76	24.5	NA	NA	.001	.003	.002	.019	.020	.010	.000	.001	.144
1/77	16.5	.176	.331	.001	.003	.002	.015	.028	.009	.001	.001	.065
2/77	46.2	.841	.752	.001	.003	.002	.025	.025	.010	.001	.001	.365
3/77	28.5	1.714	1.100	.001	.004	.003	.028	.030	.009	.001	.002	.202
4/77	31.3	2.139	.669	.001	.004	.002	.045	.021	.013	.000	.002	.227
1/78	9.7	1.320	.336	.001	.004	.002	.054	.022	.006	.001	.001	.017
2/78	25.3	1.271	.656	NA	NA	NA	.023	.025	.015	.002	NA	.211
3/78	32.9	.668	.596	NA	NA	NA	.029	.022	.017	.001	NA	.181
4/78	17.6	2.456	.546	NA	NA	NA	.096	.027	.010	.002	NA	.029
1/79	13.1	1.210	.440	NA	NA	NA	.010	.050	.005	.000	NA	.020

Correlation Coefficients - Kaibito

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.79	-0.15	0.09	0.71	0.05	0.53	0.08	0.36
Al	-	1.00	-0.06	0.19	0.67	0.55	0.78	0.10	0.22
Cu	-	-	1.00	0.17	-0.03	0.17	-0.03	0.40	0.02
Pb	-	-	-	1.00	0.29	0.37	0.14	0.22	0.17
Mn	-	-	-	-	1.00	0.33	0.64	0.01	0.03
Ni	-	-	-	-	-	1.00	0.03	0.21	-0.05
Fe	-	-	-	-	-	-	1.00	0.13	0.21
SO_4	-	-	-	-	-	-	-	1.00	0.34
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Kaibito

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	439	118	380	318	235	62	383	187	187
Al	-	118	110	103	81	27	106	99	99
Cu	-	-	380	306	216	57	341	171	171
Pb	-	-	-	318	198	52	287	147	147
Mn	-	-	-	-	235	32	229	96	96
Ni	-	-	-	-	-	62	57	36	36
Fe	-	-	-	-	-	-	383	148	148
SO_4	-	-	-	-	-	-	-	187	187
NO_3	-	-	-	-	-	-	-	-	187

Lechee, Arizona (SAROAD Site Number 030200005K03)

This station, located on the Navajo Indian Reservation approximately 4.8 km south of the Navajo Generating Station, is situated on the top of a small mesa that has bare rock in and around the proximity of the station. Page, Arizona, is about 6.4 km and the Glen Canyon Dam 8 km away. A small housing development with paved roads is located about 0.8 km west.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a low volume air sampler which are operated on the same days. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/77	43.4	2.810	2.047	.001	.004	.002	.013	.023	.008	.001	.001	.243
3/77	28.6	2.884	2.089	.001	.004	.003	.007	.027	.008	.001	.001	.182
4/77	15.0	2.445	.981	.001	.006	.003	.011	.032	.006	.001	.002	.076
1/78	8.5	2.074	.784	.001	.003	.002	.007	.025	.006	.001	.001	.020
2/78	16.8	1.386	.857	NA	NA	NA	.006	.022	.011	.001	NA	.151
3/78	18.7	.713	.775	NA	NA	NA	.006	.023	.007	.001	NA	.062
4/78	14.1	2.642	1.139	NA	NA	NA	.007	.030	.008	.001	NA	.025
1/79	13.1	2.181	.702	NA	NA	NA	.008	.024	.006	.001	NA	.049

Correlation Coefficients - Lechee

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.70	0.00	0.14	0.58	0.38	0.64	0.17	0.43
Al	-	1.00	0.27	0.24	0.58	0.15	0.76	0.12	0.09
Cu	-	-	1.00	-0.06	-0.05	0.00	0.07	0.23	0.08
Pb	-	-	-	1.00	0.18	0.31	0.07	0.23	0.29
Mn	-	-	-	-	1.00	-.10	0.47	-0.13	-0.11
Ni	-	-	-	-	-	1.00	0.28	-0.12	0.24
Fe	-	-	-	-	-	-	1.00	0.00	0.17
SO_4	-	-	-	-	-	-	-	1.00	0.62
NO_3	-	-	-	-	-	--	-	-	1.00

Number of Observations - Lechee

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	253	137	59	201	105	53	214	182	182
Al	-	137	20	116	70	30	121	110	110
Cu	-	-	59	51	27	14	54	36	36
Pb	-	-	-	201	92	44	175	145	145
Mn	-	-	-	-	105	27	99	76	76
Ni	-	-	-	-	-	53	47	39	39
Fe	-	-	-	-	-	-	214	148	148
SO_4	-	-	-	-	-	-	-	182	182
NO_3	-	-	-	-	-	-	-	-	182

Lee's Ferry, Arizona (SAROAD Site Number 030200007K03)

This station is located in the Glen Canyon National Recreation Area about 19 km west of Page, Arizona. A small campground and four homes for National Park Service personnel are 0.8 km west of the station, and a boat launching ramp and small store are 0.8 km east. A small water treatment plant and boat storage area are adjacent, and the road leading to the station is paved.

The station, operated by National Park Service personnel, is equipped with a single high volume air sampler and a flow recorder, and a 24-hour timer for the convenience of the operating personnel. Commercial power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
4/76	24.0	NA	NA	.001	.003	.002	.009	.027	.009	.001	.001	.160
1/77	18.5	3.656	1.340	.001	.003	.002	.008	.028	.007	.001	.001	.095
2/77	21.3	1.045	.896	.003	.002	.001	.007	.029	.007	.001	.001	.108
3/77	21.6	2.128	1.206	.001	.005	.003	.014	.031	.007	.001	.003	.135
4/77	11.5	1.607	.558	.001	.004	.003	.011	.027	.006	.001	.002	.045
1/78	5.9	1.339	.546	.001	.003	.002	.007	.023	.005	.001	.001	.016
2/78	15.6	1.316	.724	NA	NA	NA	.006	.018	.008	.001	NA	.107
3/78	22.8	.677	.667	NA	NA	NA	.007	.026	.008	.001	NA	.096
4/78	8.2	2.241	.618	NA	NA	NA	.006	.030	.006	.001	NA	.010
1/79	8.6	1.783	.708	NA	NA	NA	.007	.032	.006	.002	NA	.021

Correlation Coefficients - Lee's Ferry

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.65	0.01	0.11	0.46	-0.03	0.50	0.25	0.39
Al	-	1.00	-0.01	0.24	0.30	-0.18	0.61	0.23	0.43
Cu	-	-	1.00	0.22	0.03	-0.06	-0.08	0.05	0.12
Pb	-	-	-	1.00	0.12	0.38	-0.07	0.24	0.27
Mn	-	-	-	-	1.00	-0.11	0.41	-0.24	-0.09
Ni	-	-	-	-	-	1.00	-0.12	-0.26	-0.07
Fe	-	-	-	-	-	-	1.00	0.00	0.15
SO_4	-	-	-	-	-	-	-	1.00	0.56
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Lee's Ferry

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	358	140	112	257	132	57	296	204	205
Al	-	140	15	127	65	36	123	110	111
Cu	-	-	112	89	56	19	108	43	43
Pb	-	-	-	257	115	49	221	155	156
Mn	-	-	-	-	132	27	128	66	66
Ni	-	-	-	-	-	57	51	38	38
Fe	-	-	-	-	-	-	296	153	153
SO_4	-	-	-	-	-	-	-	204	204
NO_3	-	-	-	-	-	-	-	-	205

Moccasin, Arizona (SAROAD Site Number 030500009K03)

This station is located on the Kiabab-Piute Indian Reservation, approximately 105 km west of the Navajo Generating Station and 64 km east of the proposed Warner Valley power plant. A high plateau is nortwest, and a sawmill and small oil refinery about 32 km east. The Pipe Springs National Monument and a tribal office building are about 3.2 km south, and several homes are in the vicinity of the station. A small town is about 3.2 km north. The road to the station is paved. The predominantly flat terrain has sandy soil, with sparse-to-moderate vegetation. Livestock grazing is common to the area.

This station, operated by a field employee of URL, is equipped with a single volume air sampler and flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	20.9	NA	NA	.001	.004	.003	.023	.023	.006	.002	.001	.002
2/76	24.3	NA	NA	.001	.003	.002	.002	.003	.005	.000	.001	.405
3/76	18.9	NA	NA	.001	.003	.002	.009	.028	.007	.001	.001	.157
4/76	15.4	NA	NA	.001	.003	.002	.008	.026	.008	.001	.001	.079
1/77	13.7	NA	NA	.001	.003	.002	.005	.027	.007	.001	.001	.074
2/77	24.5	.426	.571	.001	.003	.002	.009	.029	.008	.001	.001	.194
3/77	19.6	3.108	2.299	.001	.004	.003	.008	.028	.011	.001	.001	.206
4/77	14.8	1.990	.434	.001	.006	.003	.009	.031	.009	.001	.002	.072
1/78	9.3	1.361	.442	.001	.003	.002	.007	.024	.006	.001	.001	.015
2/78	22.5	.686	.734	NA	NA	NA	.005	.024	.013	.001	NA	.131
3/78	20.3	1.441	.880	NA	NA	NA	.010	.027	.011	.001	NA	.092
4/78	11.8	2.298	.607	NA	NA	NA	.006	.025	.007	.001	NA	.009
1/79	12.2	2.173	.616	NA	NA	NA	.008	.031	.006	.000	NA	.022

Correlation Coefficients - Moccasin

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.37	-0.03	-0.01	0.66	-0.13	-0.53	0.26	0.58
Al	-	1.00	-0.02	0.13	0.51	0.25	0.63	0.21	0.37
Cu	-	-	1.00	0.14	-0.10	0.61	-0.03	-0.05	0.31
Pb	-	-	-	1.00	0.08	-0.39	-0.10	0.19	0.23
Mn	-	-	-	-	1.00	-0.12	0.57	0.16	0.26
Ni	-	-	-	-	-	1.00	-0.16	-0.02	-0.01
Fe	-	-	-	-	-	-	1.00	0.20	0.62
SO_4	-	-	-	-	-	-	-	1.00	0.40
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Moccasin

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	394	102	154	280	184	42	337	146	145
Al	-	102	17	89	74	12	91	81	81
Cu	-	-	154	114	71	25	141	37	37
Pb	-	-	-	280	160	35	244	122	121
Mn	-	-	-	-	184	28	178	76	75
Ni	-	-	-	-	-	42	38	18	18
Fe	-	-	-	-	-	-	337	114	113
SO4	-	-	-	-	-	-	-	146	145
NO_3	-	-	-	-	-	-	-	-	145

Red Rock, Arizona (SAROAD Site Number 030040000K03)

This station is located on the Navajo Indian Reservation about 64 km west of the Four Corners Power Plant, 80 km southwest of the San Juan Power Plant, and 48 km north of the Canyon De Chelly National Monument. Remote and relatively isolated, with the nearest paved road 16 km away, the area has many widely scattered homes and a small school. The prefominantly flat terrain is sandy, supporting only sparse vegetation.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	22.1	NA	NA	.001	.004	.005	.016	.023	.006	.002	.001	.067
2/76	37.5	NA	NA	.001	.004	.003	.021	.035	.008	.001	.001	.440
3/76	18.4	NA	NA	.001	.003	.002	.009	.029	.008	.001	.001	.200
4/76	30.1	NA	NA	.001	.003	.002	.006	.026	.010	.000	.001	.090
1/77	21.3	2.454	.440	.001	.003	.002	.007	.032	.008	.001	.001	.073
2/77	45.6	1.170	.917	.001	.003	.002	.009	.024	.011	.001	.001	.267
3/77	31.4	1.980	1.065	.001	.004	.003	.007	.019	.011	.001	.001	.092
4/77	26.3	2.046	.571	.001	.004	.002	.007	.026	.011	.001	.003	.135
1/78	9.7	2.000	.527	.001	.003	.002	.007	.030	.006	.001	.001	.016
2/78	28.2	1.678	.892	NA	NA	NA	.005	.022	.015	.001	NA	.217
3/78	32.2	.539	.484	NA	NA	NA	.008	.024	.014	.001	NA	.159
4/78	15.7	2.221	.623	NA	NA	NA	.005	.026	.009	.001	NA	.020
1/79	7.9	1.613	.502	NA	NA	NA	.007	.047	.007	.001	NA	.009

Correlation Coefficients - Red Rock

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.82	0.08	0.03	0.54	0.14	0.51	0.17	0.30
Al	-	1.00	0.56	0.23	0.81	0.09	0.86	0.10	0.37
Cu	-	-	1.00	0.30	0.02	0.71	-0.06	0.14	0.01
Pb	-	-	-	1.00	0.31	-0.17	0.11	0.19	0.26
Mn	-	-	-	-	1.00	0.01	0.52	0.10	0.13
Ni	-	-	-	-	-	1.00	-0.02	-0.15	0.08
Fe	-	-	-	-	-	-	1.00	0.11	0.17
SO_4	-	-	-	-	-	-	-	1.00	0.51
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Red Rock

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	478	126	150	311	258	63	400	206	206
Al	-	126	12	91	91	18	117	98	98
Cu	-	-	150	109	76	30	140	33	33
Pb	-	-	-	311	198	47	269	141	141
Mn	-	-	-	-	258	36	249	110	110
Ni	-	-	-	-	-	63	53	27	27
Fe	-	-	-	-	-	-	400	159	159
SO_4	-	-	-	-	-	-	-	206	206
NO_3	-	-	-	-	-	-	-	-	206

Teec Nos Pos, Arizona (SAROAD Site Number 030040000K03)

This station is located on the Navajo Indian Reservation about 64 km northwest of the Four Corners power plant and 56 km northwest of the San Juan power plant. A large school and housing development are 1.6 km east of the station and, except for the main highway, the roads in the area are unpaved. There are a few oil wells in the general area. The terrain is flat, with sandy soil sparsely vegetated.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	32.0	NA	NA	.001	.005	.004	.032	.034	.007	.001	.001	.078
2/76	37.1	NA	NA	.001	.003	.002	.024	.033	.005	.000	.001	.265
3/76	37.5	NA	NA	.001	.003	.002	.017	.030	.010	.001	.001	.333
4/76	23.9	NA	NA	.001	.003	.002	.013	.038	.010	.000	.001	.110
1/77	26.7	3.003	1.597	.001	.003	.002	.016	.023	.008	.001	.001	.086
2/77	41.1	1.360	.992	.001	.003	.002	.027	.024	.011	.001	.001	.282
3/77	28.7	2.354	1.421	.001	.004	.003	.027	.038	.011	.001	.001	.231
4/77	24.1	2.213	.715	.001	.004	.003	.293	.051	.010	.002	.002	.198
1/78	14.3	2.881	.735	.001	.003	.002	.109	.034	.006	.001	.001	.044
2/78	27.5	1.970	1.047	NA	NA	NA	.019	.040	.014	.001	.001	.206
3/78	33.6	.930	1.103	NA	NA	NA	.041	.054	.014	.001	.001	.216
4/78	19.8	3.557	1.096	NA	NA	NA	.042	.057	.009	.001	NA	.062
1/79	9.5	2.410	1.610	NA	NA	NA	.130	.040	.005	.001	NA	.020

Correlation Coefficients - Teec Nos Pos

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.84	-0.06	-0.04	0.78	-0.13	0.74	0.15	0.22
Al	-	1.00	0.17	0.24	0.90	-9.98	0.86	0.15	0.18
Cu	-	-	1.00	0.24	0.00	0.40	0.00	0.08	0.00
Pb	-	-	-	1.00	0.04	0.18	-0.04	0.26	0.28
Mn	-	-	-	-	1.00	-0.10	0.77	0.07	0.18
Ni	-	-	-	-	-	1.00	-0.16	-0.15	-0.08
Fe	-	-	-	-	-	-	1.00	0.00	0.08
SO_4	-	-	-	-	-	-	-	1.00	0.71
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Teec Nos Pos

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	352	73	307	290	203	40	323	126	126
Al	-	73	65	73	62	5	72	54	54
Cu	-	-	307	273	193	38	294	116	116
Pb	-	-	-	290	194	37	273	121	121
Mn	-	-	-	-	203	31	199	83	83
Ni	-	-	-	-	-	40	38	17	17
Fe	-	-	-	-	-	-	323	118	118
SO_4	-	-	-	-	-	-	-	126	126
NO_3	-	-	-	-	-	-	-	-	126

Tsa Schizzi, Arizona (SAROAD Site Number 030200013K03)

This station is in a remote section of the Navajo Indian Reservation about 32 km east of the Navajo Generating Station. There are no paved roads, and homes are very widely scattered. The terrain is generally flat with sandy soil and sparse vegetation. Livestock grazing is the only commercial pursuit in the area.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Power is provided by a propane driven electrical generator.

Seasonal Geometric Means

	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	21.4	NA	NA	.001	.003	.002	.018	.033	.006	.000	.001	.239
3/76	17.7	NA	NA	.001	.003	.002	.012	.021	.006	.001	.001	.259
4/76	11.2	NA	NA	.001	.003	.002	.015	.019	.006	.001	.001	.088
1/77	20.9	2.351	.783	.001	.003	.002	.011	.023	.008	.001	.001	.099
2/77	27.2	.782	.767	.001	.004	.002	.012	.037	.007	.001	.001	.141
3/77	14.3	1.970	1.279	.001	.003	.003	.017	.028	.007	.000	.002	.111
4/77	10.8	1.220	.320	.001	.003	.002	.014	.022	.005	.000	.004	.106
1/78	18.8	2.098	.360	.001	.003	.002	.025	.019	.006	.001	.001	.046
2/78	20.0	.362	.664	NA	NA	NA	.043	.027	.009	.001	NA	.139
3/78	19.8	1.904	1.136	NA	NA	NA	.048	.024	.009	.001	NA	.089
4/78	8.9	2.479	.709	NA	NA	NA	.036	.026	.005	.001	NA	.010
1/79	6.2	1.804	.519	NA	NA	NA	.036	.037	.005	.000	NA	.027

Correlation Coefficients - Tsa Schizzi

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.34	0.06	0.10	-0.02	0.46	0.43	0.05	0.37
Al	-	1.00	0.00	0.41	0.75	-9.98	0.83	0.18	0.50
Cu	-	-	1.00	0.09	0.00	-0.13	-0.07	0.06	0.01
Pb	-	-	-	1.00	0.62	-0.31	0.01	0.35	0.40
Mn	-	-	-	-	1.00	-0.18	0.20	-0.13	0.04
Ni	-	-	-	-	-	1.00	0.18	-0.38	0.32
Fe	-	-	-	-	-	-	1.00	-0.03	0.12
SO_4	-	-	-	-	-	-	-	1.00	0.43
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Tsa Schizzi

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	181	40	139	94	57	13	156	84	84
Al	-	40	35	27	12	3	32	36	36
Cu	-	-	139	85	46	13	125	67	67
Pb	-	-	-	94	35	9	85	44	44
Mn	-	-	-	-	57	9	55	22	22
Ni	-	-	-	-	-	13	12	7	7
Fe	-	-	-	-	-	-	156	66	66
SO_4	-	-	-	-	-	-	-	84	84
NO3	-	-	-	-	-	-	-	-	84

Tuba City, Arizona (SAROAD Site Number 030200014K03)

This station is on a Navajo Indian Reservation about 97 km south of the Navajo Generating Station, 56 km east of the Grand Canyon National Park boundary, and 1.6 km north of Tuba City. The station is accessible by a dirt road from the town. The terrain is mostly flat with some rolling hills. The ground is sandy, supporting only sparse vegetation.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available. The original site was 8 km to the east of its present location prior to October 6, 1976.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/77	32.3	1.700	.555	.001	.003	.002	.026	.023	.011	.001	.001	.222
2/77	46.2	.814	.805	.001	.003	.002	.030	.023	.012	.001	.001	.296
3/77	45.6	1.552	1.102	.001	.003	.003	.090	.033	.018	.001	.002	.286
4/77	31.9	1.549	.566	.001	.004	.002	.098	.027	.012	.001	.001	.189
1/78	14.4	2.076	.551	.001	.003	.002	.117	.025	.008	.001	.001	.042
2/78	31.6	1.435	.828	NA	NA	NA	.066	.019	.016	.001	NA	.224
3/78	34.9	.663	.698	.003	.003	.002	.079	.027	.016	.001	.001	.194
4/78	15.8	2.013	.612	.003	.003	.002	.073	.031	.008	.001	.001	.025
1/79	13.8	2.144	.537	NA	NA	NA	.062	.024	.008	.001	NA	.017
2/79	37.2	.960	.480	NA	NA	NA	.030	.020	.020	.001	NA	.110

Correlation Coefficients - Tuba City

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.82	-0.13	-0.02	0.76	0.05	0.63	0.12	0.21
Al	-	1.00	-0.11	-0.03	0.85	-0.12	0.89	0.13	0.27
Cu	-	-	1.00	0.18	-0.12	0.01	-0.10	-0.04	-0.14
Pb	-	-	-	1.00	0.03	0.00	-0.01	0.11	0.11
Mn	-	-	-	-	1.00	-0.08	0.68	0.09	0.04
Ni	-	-	-	-	-	1.00	0.17	0.35	0.09
Fe	-	-	-	-	-	-	1.00	0.05	0.12
SO_4	-	-	-	-	-	-	-	1.00	0.31
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Tuba City

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	301	123	287	237	212	40	266	197	197
Al	-	123	119	105	98	19	118	99	99
Cu	-	-	287	232	206	40	256	188	188
Pb	-	-	-	237	177	37	213	156	156
Mn	-	-	-	-	212	33	209	129	129
Ni	-	-	-	-	-	40	35	27	27
Fe	-	-	-	-	-	-	266	168	168
SO_4	-	-	-	-	-	-	-	197	197
NO_3	-	-	-	-	-	-	-	-	197

Ignacio, Colorado (SAROAD Site Number 061300003K03)

This station is located about 4.8 km west of Ignacio, Colorado (approx. population 800) on the Southern Ute Indian Reservation, about 80 km northeast of the San Juan power plant and 97 km northeast of the Four Corners power plant. The semimountainous area is heavily farmed, the station itself being on an irrigated farm. There are some oil wells in the vicinity of the station. The road to the station is dirt. Most of the area is moderately vegetated.

The station, operated by a field employee of the URL, is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	22.2	NA	NA	.001	.005	.005	.027	.029	.007	.002	.001	.101
2/76	22.3	NA	NA	.001	.004	.002	.024	.034	.007	.001	.001	.275
3/72	17.9	NA	NA	.001	.003	.002	.027	.026	.006	.000	.001	.175
4/76	26.6	NA	NA	.001	.003	.002	.014	.032	.009	.001	.001	.092
1/77	29.3	NA	NA	.001	.003	.002	.018	.023	.008	.000	.001	.104
2/77	27.2	0.791	0.673	.001	.003	.002	.021	.028	.008	.001	.001	.146
3/77	22.1	1.850	.925	.001	.004	.003	.037	.030	.010	.001	.002	.139
4/77	16.3	1.522	.422	.001	.005	.003	.030	.035	.010	.001	.002	.114
1.78	12.8	1.859	.638	.001	.003	.002	.032	.026	.006	.001	.001	.013
2/78	22.3	1.754	.771	NA	NA	NA	.043	.027	.013	.001	NA	.150
3/78	23.6	1.210	.428	NA	NA	NA	.077	.034	.011	.001	NA	.113
4/78	19.1	2.314	.511	NA	NA	NA	.052	.035	.011	.001	NA	.060
1/79	14.1	3.329	1.205	NA	NA	NA	.025	.039	.006	.001	NA	.008
2/79	16.2	2.085	.713	NA	NA	NA	.024	.026	.007	.002	NA	.038

Correlation Coefficients - Ignacio

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.63	0.12	-0.08	0.28	0.54	0.45	0.23	0.26
Al	-	1.00	0.19	0.18	0.66	0.36	0.78	-0.01	0.09
Cu	-	-	1.00	0.07	0.35	0.59	0.27	0.21	0.18
Pb	-	-	-	1.00	0.13	-0.17	0.04	0.38	0.37
Mn	-	-	-	-	1.00	0.32	0.57	0.07	0.23
Ni	-	-	-	-	-	1.00	0.49	0.01	0.05
Fe	-	-	-	-	-	-	1.00	0.00	0.04
SO_4	-	-	-	-	-	-	-	1.00	0.67
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Ignacio

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	334	69	294	256	174	51	281	119	119
Al	-	69	65	67	54	15	64	56	56
Cu	-	-	294	294	166	50	253	109	109
Pb	-	-	-	-	161	47	220	100	100
Mn	-	-	-	-	174	35	171	70	70
Ni	-	-	-	-	-	51	45	26	16
Fe	-	-	-	-	-	-	281	94	94
SO_4	-	-	-	-	-	-	-	119	119
NO_3	-	-	-	-	-	-	-	-	119

Red Mesa, Colorado (SAROAD Site Number 061300002K03)

This station is on the Southern Ute Indian Reservation about 56 km north of the Four Corners power plant, 40 km north of the San Juan power plant, and 48 km southeast of Mesa Verde National Park. The semimountainous area is extensively dry-land farmed, farm homes are scattered, and the roads are dirt.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	34.9	NA	NA	.001	.004	.003	.019	.028	.010	.001	.001	.338
3/76	16.6	NA	NA	.001	.003	.002	.012	.021	.008	.001	.001	.287
4/76	29.7	1.880	.670	.001	.003	.002	.010	.023	.012	.001	.001	.175
1/77	23.2	2.661	.966	.001	.003	.002	.009	.026	.007	.001	.001	.070
2/77	49.1	.798	.665	.001	.003	.002	.012	.030	.009	.001	.001	.262
3/77	26.7	1.821	.870	.001	.005	.002	.017	.028	.008	.001	.002	.144
4/77	23.4	2.382	.389	.001	.007	.003	.017	.038	.009	.002	.002	.137
1/78	10.7	1.727	.386	.001	.003	.002	.011	.025	.005	.001	.001	.010
2/78	31.6	1.049	.484	NA	NA	NA	.016	.023	.016	.002	NA	.219
3/78	37.1	.780	.503	NA	NA	NA	.036	.025	.017	.001	NA	.231
4/78	16.4	2.215	.399	NA	NA	NA	.014	.035	.010	.002	NA	.038
1/79	8.7	2.741	.411	NA	NA	NA	.006	.028	.007	.001	NA	.004

Correlation Coefficients - Red Mesa

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.67	0.11	0.01	0.44	-0.01	0.60	0.19	0.43
Al	-	1.00	-0.02	0.02	0.59	0.00	0.91	-0.01	0.28
Cu	-	-	1.00	0.17	0.14	0.34	-0.02	0.05	0.06
Pb	-	-	-	1.00	0.07	0.01	-0.08	0.24	0.19
Mn	-	-	-	-	1.00	0.10	0.58	-0.01	0.05
Ni	-	-	-	-	-	1.00	0.01	0.10	0.12
Fe	-	-	-	-	-	-	1.00	-0.01	0.20
SO_4	-	-	-	-	-	-	-	1.00	0.55
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Red Mesa

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	372	109	266	266	203	64	315	168	167
Al	-	109	78	94	76	28	91	86	86
Cu	-	-	266	215	157	50	233	122	121
Pb	-	-	-	266	166	53	232	132	132
Mn	-	-	-	-	203	41	196	89	89
Ni	-	-	-	-	-	64	52	43	43
Fe	-	-	-	-	-	-	315	132	132
SO_4	-	-	-	-	-	-	-	168	167
NO_3	-	-	-	-	-	-	-	-	167

Towaoc, Colorado (SAROAD Site Number 061600004K03)

This station is on the Ute Mountain Indian Reservation about 56 km northwest of the Four Corners power plant, 40 km north of the San Juan power plant, 16 km west of Mesa Verde National Park, and 24 km east of Hovenweep National Monument. About 1.6 km east of Towaoc (population 800) and 0.4 km from a paved road, the station is situated in lowlands between high, rocky mesas. The soil is sandy and sparsely vegetated. Livestock grazing is the principal agricultural activity.

The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorded. Commercial electrical power is availabie.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	33.1	NA	NA	.001	.003	.003	.039	.038	.013	.010	.010	.152
3/76	18.7	NA	NA	.001	.003	.002	.021	.025	.006	.001	.001	.140
4/76	26.0	2.180	.730	.001	.003	.002	.014	.021	.009	.000	.001	.121
1/77	19.2	1.215	1.391	.001	.003	.002	.017	.023	.006	.001	.001	.090
2/77	34.6	1.696	1.038	.001	.003	.002	.013	.027	.007	.001	.001	.189
3/77	27.7	2.212	1.199	.001	.004	.003	.036	.031	.009	.001	.002	.196
4/77	20.4	2.146	.725	.001	.005	.003	.037	.038	.008	.001	.002	.168
1/78	9.3	1.823	.520	.001	.003	.002	.095	.032	.006	.001	.001	.029
2/78	15.9	1.230	.677	NA	NA	NA	.025	.027	.009	.001	NA	.166
3/78	21.3	.570	.700	NA	NA	NA	.046	.033	.009	.001	NA	.125
4/78	12.7	2.825	.732	NA	NA	NA	.050	.034	.006	.001	NA	.043
1/79	14.5	2.615	1.248	NA	NA	NA	.019	.041	.005	.000	NA	.092

Correlation Coefficients - Towaoc

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.54	-0.05	-0.08	0.67	-0.02	0.56	0.19	0.38
Al	-	1.00	-0.20	0.00	0.53	-0.23	0.55	-0.05	0.22
Cu	-	-	1.00	0.15	0.00	-0.06	-0.06	0.17	-0.09
Pb	-	-	-	1.00	-0.01	0.09	-0.09	0.32	0.25
Mn	-	-	-	-	1.00	0.58	0.59	-0.01	0.05
Ni	-	-	-	-	-	1.00	0.01	0.00	-0.16
Fe	-	-	-	-	-	-	1.00	-0.02	0.09
SO_4	-	-	-	-	-	-	-	1.00	0.52
NO_3	-	-	-	-	-	-	-	-	1.00
								-	-

Number of Observations - Towaoc

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	365	125	310	311	165	40	326	179	179
Al	-	125	115	124	67	19	115	97	97
Cu	-	-	310	289	157	36	283	153	153
Pb	-	-	-	311	159	37	282	158	158
Mn	-	-	-	-	165	27	163	74	74
Ni	-	-	-	-	-	40	33	26	26
Fe	-	-	-	-	-	-	326	154	154
SO_4	-	-	-	-	-	-	-	179	179
NO_3	-	-	-	-	-	-	-	-	179

Burnham, New Mexico (SAROAD Site Number 321000012K03)

This station is located in a remote and isolated area about 40 km south of the Four Corners power plant, 56 km south of the San Juan power plant, 48 km north of Chaco Canyon National Monument and 4.8 km east of a small trading post and school and the only paved road in the area. The arid region contains many deep arroyos, sandy soil and only sparse vegetation. This station is on the site of a proposed coal mine and coal gasification plant.

Operated by a field employee of URL, this station is equipped with a single high volume air sampler and a flow recorder. A propane electrical generator provides power.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	31.3	NA	NA	.001	.003	.002	.021	.035	.007	.001	.001	.298
3/76	19.7	NA	NA	.001	.003	.002	.018	.026	.008	.001	.001	119
4/76	21.6	4.815	.975	.001	.003	.002	.023	.020	.010	.001	.001	.077
1/77	36.9	2.012	.602	.001	.003	.002	.025	.021	.011	.001	.001	.151
2/77	63.1	1.362	1.034	.001	.004	.003	.020	.030	.010	.000	.001	.267
3/77	27.5	2.034	1.498	.001	.007	.004	.078	.021	.009	.001	.001	.285
4/77	46.4	2.270	.700	.001	.003	.002	.040	.022	.005	.000	.001	.127
1/78	26.1	2.821	1.080	.003	.003	.002	.092	.014	.010	.002	.001	.219
2/78	27.2	.997	1.100	NA	NA	NA	.041	.023	.013	.004	NA	.335
3/78	19.7	.440	.492	NA	NA	NA	.032	.017	.008	.001	NA	.128
4/78	22.0	4.018	1.135	NA	NA	NA	.035	.026	.009	.001	NA	.209
1/79	10.4	2.140	1.090	NA	NA	NA	.050	.010	.005	.000	NA	.002

Correlation Coefficients - Burnham

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.28	-0.06	0.02	0.93	-0.41	0.80	0.05	0.08
Al	-	1.00	0.43	0.03	0.22	0.06	0.62	-0.09	0.40
Cu	-	-	1.00	0.17	-0.11	-0.03	-0.02	-0.42	0.24
Pb	-	-	-	1.00	-0.05	0.00	0.06	0.04	0.05
Mn	-	-	-	-	1.00	-0.16	0.92	0.15	0.36
Ni	-	-	-	-	-	1.00	0.44	-0.24	-0.10
Fe	-	-	-	-	-	-	1.00	-0.18	0.40
SO_4	-	-	-	-	-	-	-	1.00	0.00
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Burnham

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	171	25	146	114	103	19	154	50	50
Al	-	25	24	22	21	6	25	21	21
Cu	-	-	146	111	96	19	136	46	46
Pb	-	-	-	114	85	14	110	37	37
Mn	-	-	-	-	103	17	99	33	33
Ni	-	-	-	-	-	19	18	13	13
Fe	-	-	-	-	-	-	154	48	48
SO_4	-	-	-	-	-	-	-	50	50
NO_3	-	-	-	-	-	-	-	-	50

Chaco Canyon, New Mexico (SAROAD Site Number 321000011K03)

This station is in the Chaco Canyon National Monument about 89 km southeast of the Four Corners power plant. In a very isolated area, with no paved roads with a 40-km radius, the site is in a canyon with steep, bare-rock sides. The area is sandy with many bare-rock outcroppings and sparse vegetation. A small visitor center and four homes for National Park Service personnel are in the vicinity of the station.

Operated by National Park Service personnel, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available, and a 24-hour timer is installed for the convenience of NPS personnel.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	55.8	NA	NA	.001	.003	.002	.005	.050	.020	.000	.001	.360
3/76	40.1	NA	NA	.001	.003	.002	.008	.019	.016	.001	.001	.371
4/76	33.5	NA	NA	.001	.003	.002	.006	.025	.014	.000	.001	.216
1/77	22.0	2.770	1.020	.001	.003	.002	.007	.024	.010	.001	.001	.152
2/77	40.7	.845	.763	.001	.003	.002	.008	.027	.015	.000	.001	.602
3/77	33.0	2.040	1.160	.001	.003	.002	.006	.026	.027	.001	.002	.360
4/77	30.9	2.074	.633	.001	.004	.003	.006	.024	.024	.001	.002	.365
1/78	11.5	2.139	.452	.001	.003	.002	.006	.021	.007	.001	.001	.054
2/78	43.3	1.305	.751	NA	NA	NA	.006	.026	.039	.001	NA	.483
3/78	41.0	536	.651	NA	NA	NA	.005	.025	.036	.001	NA	.449
4/78	19.0	3.018	.802	NA	NA	NA	.005	.027	.013	.001	NA	.056
1/79	9.5	1.650	.497	NA	NA	NA	.005	.026	.007	.001	NA	.029

Correlation Coefficients - Chaco Canyon

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.91	-0.08	0.32	0.54	0.03	0.82	0.15	0.49
Al	-	1.00	-0.22	0.65	0.71	0.01	0.92	0.09	0.51
Cu	-	-	1.00	-0.08	-0.24	-0.25	-0.14	0.04	-0.06
PB	-	-	-	1.00	0.44	0.12	0.27	0.12	0.39
Mn	-	-	-	-	1.00	0.03	0.59	-0.02	0.41
Ni	-	-	-	-	-	1.00	0.04	0.07	0.18
Fe	-	-	-	-	-	-	1.00	0.03	0.40
SO_4	-	-	-	-	-	-	-	1.00	0.48
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Chaco Canyon

	TSP	Al	Cu	Pb	Nm	Ni	Fe	SO_4	NO_3
TSP	311	108	52	221	230	39	282	153	153
Al	-	108	6	87	92	26	100	83	83
Cu	-	-	52	42	37	5	52	21	21
Pb	-	-	-	221	181	26	208	116	116
Mn	-	-	-	-	230	34	227	108	108
Ni	-	-	-	-	-	39	37	32	32
Fe	-	-	-	-	-	-	282	134	134
SO_4	-	-	-	-	-	-	-	153	153
NO_3	-	-	-	-	-	-	-	-	153

Dulce, New Mexico (SAROAD Site Number 320920003K03)

This site is on the Jicarilla Apache Indian Reservation about 130 km east of the Four Corners power plant, in an isolated area about 8 km south of the town of Dulce (population 800). The area is mountainous and forested. There is some livestock grazing in the vicinity and the only road near the station is dirt.

Operated by a field employee of URL, the station is equipped with a single single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	13.7	NA	NA	.001	.004	.004	.020	.021	.006	.002	.001	.020
2/76	19.3	NA	NA	.001	.004	.003	.023	.029	.008	.001	.001	.312
3/76	9.0	NA	NA	.001	.003	.002	.019	.033	.005	.001	.001	.096
4/76	10.2	NA	NA	.001	.003	.002	.010	.029	.006	.000	.001	.041
1/77	15.3	2.182	.600	.001	.003	.002	.022	.018	.007	.000	.001	.081
2/77	20.7	.954	.578	.001	.003	.002	.014	.025	.007	.001	.001	.143
3/77	10.9	1.718	.629	.001	.004	.003	.053	.023	.006	.001	.002	.038
4/77	10.6	1.552	.300	.001	.004	.003	.055	.022	.006	.001	.002	.068
1/78	7.8	1.952	.397	.001	.003	.002	.080	.021	.006	.001	.001	.012
2/78	19.4	1.763	.610	NA	NA	NA	.061	.022	.010	.001	NA	.136
3/76	17.4	.737	.511	NA	NA	NA	.050	.020	.008	.001	NA	.090
4/78	10.4	2.077	.428	NA	NA	NA	.076	.028	.009	.001	NA	.014
1/79	9.0	2.937	.550	NA	NA	NA	.023	.029	.005	.000	NA	.009

Correlation Coefficients - Dulce

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.52	-0.12	0.05	0.40	0.20	0.52	0.24	0.51
Al	-	1.00	-0.15	0.40	0.66	-0.36	0.79	-0.06	0.31
Cu	-	-	1.00	0.06	-0.06	0.02	-0.19	0.15	0.00
Pb	-	-	-	1.00	0.31	0.00	0.14	0.00	0.11
Mn	-	-	-	-	1.00	0.16	0.48	0.11	0.01
Ni	-	-	-	-	-	1.00	0.04	0.16	0.08
Fe	-	-	-	-	-	-	1.00	0.03	0.25
SO_4	-	-	-	-	-	-	-	1.00	0.39
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Dulce

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	423	97	375	287	139	64	342	168	167
Al	-	97	94	80	57	16	83	78	78
Cu	-	-	375	281	134	64	309	157	156
Pb	-	-	-	287	119	55	241	125	124
Mn	-	-	-	-	139	33	132	66	66
Ni	-	-	-	-	-	64	55	27	27
Fe	-	-	-	-	-	-	342	129	128
SO_4	-	-	-	-	-	-	-	168	167
NO_3	-	-	-	-	-	-	-	-	167

Huerfano, New Mexico (SAROAD Site Number 32100000K03)

This station is on the Navajo Indian reservation about 48 km southeast of the Four Corners power plant and 64 km southeast of the San Juan power plant. A trading post and tribal building are nearby, with scattered homes throughout the area. A paved road leads to within 0.8 km of the station. The predominantly flat terrain of sandy soil supports a little agricultural activity. There are numerous oil and natural gas wells in the area.

Operated by a field employee of the URL, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/76	53.7	NA	NA	.001	.004	.003	.028	.040	.008	.001	.001	.541
3/76	36.5	NA	NA	.001	.003	.002	.040	.022	.011	.000	.001	.287
4/76	47.6	5.270	1.160	.001	.003	.002	.057	.025	.011	.001	.001	.220
1/77	49.0	3.322	1.045	.001	.003	.002	.039	.022	.012	.001	.001	.409
2/77	51.4	.362	.624	.001	.003	.002	.050	.023	.017	.001	.001	.611
3/77	34.4	1.981	1.092	.001	.004	.003	.079	.034	.017	.001	.002	.421
4/77	34.5	2.688	.610	.001	.005	.003	.080	.036	.016	.001	.002	.304
1/78	16.9	2.917	.605	.001	.003	.002	.067	.020	.009	.001	.001	.113
2/78	42.6	2.328	.825	NA	NA	NA	.035	.028	.029	.002	NA	.441
3/78	43.9	1.311	.855	NA	NA	NA	.129	.032	.022	.001	NA	.323
4/78	22.3	3.512	.666	NA	NA	NA	.031	.036	.014	.002	NA	.074
1/79	13.6	1.971	.762	NA	NA	NA	.016	.016	.007	.001	NA	.043

Correlation Coefficients - Huerfano

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.74	0.00	-0.01	0.49	-0.13	0.65	0.08	0.36
Al	-	1.00	0.11	0.29	0.65	-0.05	0.89	0.17	0.19
Cu	-	-	1.00	0.20	0.07	0.44	0.18	0.03	0.15
Pb	-	-	-	1.00	0.27	0.08	0.10	0.22	0.19
Mn	-	-	-	-	1.00	-0.08	0.68	0.01	0.29
Ni	-	-	-	-	-	1.00	0.00	-0.10	-0.08
Fe	-	-	-	-	-	-	1.00	0.02	0.23
SO_4	-	-	-	-	-	-	-	1.00	0.24
NO_3	-	-	-	-	-	-	-	-	0.00

Number of Observations - Huerfano

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	377	126	352	299	283	66	360	174	174
Al	-	126	118	116	116	37	124	103	103
Cu	-	-	352	286	272	61	343	159	159
Pb	-	-	-	299	251	53	287	154	154
Mn	-	-	-	-	283	58	283	138	138
Ni	-	-	-	-	-	66	62	47	47
Fe	-	-	-	-	-	-	360	161	161
SO_4	-	-	-	-	-	-	-	174	174
NO_3	-	-	-	-	-	-	-	-	174

Aneth, Utah (SAROAD Site Number 460960003K03)

This station is on the Navajo Indian Reservation at the western border of the Mountain Ute Indian Reservation about 80 km northwest of the Four Corners power plant and 64 km northwest of the San Juan power plant, and near the San Juan River. A school and several homes are nearby. The terrain consists of rolling hills and mesas, the soil sandy and sparsely vegetated. The road to the station is paved. There is a concentration of oil wells in the vicinity and livestock grazing is common. The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	34.5	NA	NA	.001	.004	.002	.041	.027	.005	.001	.001	.140
2/76	34.4	NA	NA	.001	.003	.002	.021	.034	.006	.000	.001	.113
3/76	27.0	NA	NA	.001	.003	.002	.018	.027	.005	.001	.001	.259
4/76	30.2	NA	NA	.001	.003	.002	.016	.030	.009	.001	.001	.101
1/77	28.7	1.996	1.228	.001	.003	.002	.016	.031	.007	.000	.001	.090
2/77	36.0	1.180	.822	.001	.003	.002	.016	.026	.-08	.001	.001	.201
3/77	25.9	2.061	1.342	.001	.003	.002	.025	.023	.009	.000	.001	.145
4/77	25.1	2.154	.949	.001	.003	.003	.035	.035	.009	.001	.002	.171
1/78	11.4	2.628	.737	.001	.002	.002	.042	.029	.006	.001	.001	.020
2/78	27.5	1.922	.924	NA	NA	NA	.033	.023	.012	.001	NA	.182
3/78	30.3	1.271	1.048	NA	NA	NA	.050	.030	.012	.001	NA	.184
4/78	17.2	3.093	1.039	NA	NA	NA	.037	.038	.008	.001	NA	.042
1/79	13.0	.747	.377	NA	NA	NA	.012	.032	.007	.001	NA	.039

Correlation Coefficients - Aneth

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.72	-0.11	-0.06	0.67	-0.14	0.62	0.10	0.23
Al	-	1.00	0.28	0.08	0.80	-0.19	0.94	0.08	0.33
Cu	-	-	1.00	0.21	0.03	0.10	0.00	0.19	0.13
Pb	-	-	-	1.00	-0.03	0.10	-0.04	0.28	0.32
Mn	-	-	-	-	1.00	-0.11	0.70	-0.03	0.15
Ni	-	-	-	-	-	1.00	-0.07	0.41	-0.06
Fe	-	-	-	-	-	-	1.00	-0.05	0.21
SO_4	-	-	-	-	-	-	-	1.00	0.57
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Aneth

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	445	135	389	324	212	46	400	192	192
Al	-	135	128	122	88	24	129	108	108
Cu	-	-	389	307	200	45	357	171	171
Pb	-	-	-	324	183	42	299	157	157
Mn	-	-	-	-	212	37	208	101	101
Ni	-	-	-	-	-	46	42	28	28
Fe	-	-	-	-	-	-	400	173	173
SO_4	-	-	-	-	-	-	-	192	192
NO_3	-	-	-	-	-	-	-	-	192

Bloomington, Utah (SAROAD Site Number 461280001K03)

This station is located near the Virgin River about 19 km west of the proposed Warner Valley Power Project and 56 km southwest of Zion National Park. St. Goerge, Utah, is 8km north of the station which is situated in a small irrigated farming area surrounded by hills. The soil is sandy and sparsely vegetated. The road to the station is paved, Interstate 15 passing within 4.8 km. Operated by a field operator employed by URL, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	26.0	NA	NA	.001	.004	.003	.056	.019	.006	.001	.001	.080
2/76	31.9	NA	NA	.001	.004	.003	.057	.045	.009	.001	.001	.427
3/76	30.2	NA	NA	.001	.005	.002	.082	.030	.009	.002	.001	.399
4/76	24.5	1.800	.410	.001	.003	.002	.066	.038	.008	.000	.001	.084
1/77	19.3	NA	NA	.001	.003	.002	.063	.032	.007	.001	.001	.076
2/77	29.6	2.125	1.326	.001	.003	.002	.046	.024	.008	.001	.001	.143
3/77	26.4	4.408	1.549	.001	.004	.002	.191	.040	.008	.001	.002	.198
4/77	25.7	1.721	.865	.001	.004	.002	.119	.045	.008	.001	.002	.181
1/78	73.0	1.261	.656	.001	.003	.002	.124	.026	.005	.001	.001	.024
2/78	26.0	1.722	.935	.001	.003	.002	.101	.030	.013	.001	.001	.198
3/78	28.9	1.307	1.091	NA	NA	NA	.052	.042	.010	.001	NA	.149
4/78	19.1	2.002	.929	NA	NA	NA	.056	.044	.008	.001	NA	.048
1/79	11.3	1.653	.658	NA	NA	NA	.133	.022	.005	.000	NA	.022

Correlation Coefficients - Bloomington

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.78	-0.10	0.12	0.49	-0.14	0.53	0.44	0.32
Al	-	1.00	-0.08	0.01	0.66	0.54	0.83	0.11	0.23
Cu	-	-	1.00	0.16	-0.06	0.16	0.05	-0.09	0.06
Pb	-	-	-	1.00	0.14	-0.05	0.13	0.23	0.23
Mn	-	-	-	-	1.00	-0.01	0.36	0.19	0.22
Ni	-	-	-	-	-	1.00	0.09	-0.36	-0.02
Fe	-	-	-	-	-	-	1.00	0.33	0.14
SO_4	-	-	-	-	-	-	-	1.00	0.49
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Bloomington

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	402	99	389	340	201	58	363	160	160
Al	-	99	98	91	65	15	91	82	82
Cu	-	-	389	334	199	57	355	155	155
Pb	-	-	-	340	190	54	314	140	140
Mn	-	-	-	-	201	38	199	77	77
Ni	-	-	-	-	-	58	52	25	25
Fe	-	-	-	-	-	-	363	142	142
SO_4	-	-	-	-	-	-	-	160	160
NO_3	-	-	-	-	-	-	-	-	160

Escalante, Utah (SAROAD Site Number 460300002K03)

This station is about 97 km north of the Navajo Generating Station, 86 km west of the Glen Canyon National Recreation Area, 48 km east of Bryce Canyon National Park and about 50 km north of the proposed Kaiparowits Plateau development. It is in a small irrigated farming area about 3.2 km south of Escalante (population 1,000). Areas to the north are forested but to the south are large rock mesas rising from sandy, sparsely vegetated soil. The road to the station is dirt. Operated by a field employee of URL, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	51.9	NA	NA	.001	.004	.004	.045	.023	.007	.002	.001	.128
2/76	78.5	NA	NA	.001	.004	.003	.042	.037	.010	.001	.002	.469
3/76	53.3	NA	NA	.001	.003	.002	.044	.022	.010	.001	.001	.242
4/76	59.0	.176	.887	.001	.003	.002	.056	.021	.012	.000	.001	.323
1/77	55.2	.084	.343	.001	.003	.002	.031	.020	.015	.001	.001	.275
2/77	85.7	.860	.577	.001	.003	.002	.035	.025	.011	.001	.001	.352
3/77	42.6	1.625	.846	.001	.004	.003	.080	.031	.012	.001	.002	.232
4/77	42.3	1.358	.418	.001	.005	.003	.112	.026	.011	.001	.003	.188
1/78	18.8	1.389	.363	.001	.003	.002	.101	.026	.006	.001	.001	.043
2/78	46.3	1.355	.593	NA	NA	NA	.099	.021	.015	.001	NA	.311
3/78	38.0	1.178	.640	NA	NA	NA	.095	.022	.011	.001	NA	.164
4/78	17.7	2.000	.340	NA	NA	NA	.061	.031	.008	.001	NA	.013
1/79	12.8	1.487	.597	NA	NA	NA	.011	.050	.006	.000	NA	.058

Correlation Coefficients - Escalante

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.75	-0.04	0.00	0.53	-0.13	0.53	0.04	0.29
Al	-	1.00	0.22	-0.12	0.71	-0.28	0.84	-0.07	0.02
Cu	-	-	1.00	0.04	0.02	0.11	0.04	-0.08	0.06
Pb	-	-	-	1.00	0.11	0.17	0.01	-0.05	0.14
Mn	-	-	-	-	1.00	-0.18	0.72	0.00	0.18
Ni	-	-	-	-	-	1.00	-0.23	-0.07	-0.20
Fe	-	-	-	-	-	-	1.00	0.02	0.25
SO_4	-	-	-	-	-	-	-	1.00	0.40
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Escalante

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	409	106	394	290	266	70	367	175	175
Al	-	106	105	87	83	26	99	88	87
Cu	-	-	394	287	256	67	356	170	170
Pb	-	-	-	290	204	62	269	134	134
Mn	-	-	-	-	266	56	256	111	112
Ni	-	-	-	-	-	70	64	40	40
Fe	-	-	-	-	-	-	367	150	150
SO_4	-	-	-	-	-	-	-	175	173
NO_3	-	-	-	-	-	-	-	-	175

Glen Canyon, Utah (SAROAD Site Number 460400003K03)

This station is located just outside the Glen Ganyon National Recreation area about 32 km northwest of the Navajo Generating Station, 32 km south of the proposed Kaiparowits Plateau development, and 80 km southeast of Bryce Canyon National Park. Three homes are near the station which is accessible by dirt road from U.S. 89 about 0.8 km away. The hilly, sandy soil supports sparse vegetation. Operated by a field employee of URL, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
4/76	16.3	NA	NA	.001	.003	.002	.009	.025	.007	.000	.001	.081
1/77	17.0	1.187	.636	.001	.003	.002	.009	.025	.006	.001	.001	.066
2/77	22.1	.330	.668	.001	.003	.002	.010	.024	.007	.001	.001	.123
3/77	18.4	1.908	1.408	.001	.004	.003	.010	.022	.007	.001	.001	.133
4/77	15.2	1.766	.706	.001	.005	.003	.002	.031	.007	.001	.002	.135
1/78	9.0	1.590	.467	.001	.003	.002	.007	.022	.006	.001	.001	.029
2/78	14.7	1.428	.852	NA	NA	NA	.008	.023	.010	.001	NA	.127
3/78	22.2	.605	.703	NA	NA	NA	.007	.031	.010	.001	NA	.117
4/78	14.1	2.697	.877	NA	NA	NA	.006	.034	.009	.001	NA	.029
1/79	16.3	2.296	.636	NA	NA	NA	.012	.013	.006	.001	NA	.057

Correlation Coefficients - Glen Canyon

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.63	-0.02	0.07	0.44	-0.26	0.59	0.25	0.47
Al	-	1.00	0.19	0.06	0.70	-0.26	0.86	0.07	0.31
Cu	-	-	1.00	0.21	-0.01	-0.21	0.07	-0.17	-0.05
Pb	-	-	-	1.00	0.06	-0.03	0.00	0.13	0.26
Mn	-	-	-	-	1.00	0.16	0.70	0.02	0.12
Ni	-	-	-	-	-	1.00	-0.29	-0.09	-0.16
Fe	-	-	-	-	-	-	1.00	0.10	0.25
SO_4	-	-	-	-	-	-	-	1.00	0.48
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Glen Canyon

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	345	141	162	272	148	42	299	195	194
Al	-	141	48	129	88	28	124	118	118
Cu	-	-	162	142	76	21	156	79	78
PB	-	-	-	272	136	38	242	166	165
Mn	-	-	-	-	148	24	142	93	93
Ni	-	-	-	-	-	42	38	32	32
Fe	-	-	-	-	-	-	299	161	160
SO_4	-	-	-	-	-	-	-	195	194
NO_3	-	-	-	-	-	-	-	-	194

Henrieville, Utah (SAROAD Site Number 460300003K03)

This station as about 48 km northwest of the proposed Kaiparowits Plateau development, 16 km east of Bryce CAnyon National Park, and about 1.6 km south of Henrieville (population 200). The hilly terrain has good ground cover where it is farmed and to the north and west where it is heavily forested. To the south and east, vegetation is sparse. The road to the station is dirt. Operated by a field employee of URL, the station is equipped for various sampling activities and includes a high volume air sampler, a two-stage high volume air sampler (for size-range separation of particulates), and a three-stage, multiday, cascade impactor (for size separation of particulates into three size ranges). Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	31.2	NA	NA	.001	.004	.004	.037	.022	.006	.001	.001	.112
2/76	34.5	NA	NA	.001	.003	.002	.025	.035	.007	.000	.001	.286
3/76	84.2	NA	NA	.001	.003	.002	.042	.020	.012	.001	.001	.565
4/76	54.7	1.510	.630	.001	.003	.002	.022	.028	.008	.000	.001	.168
1/77	31.4	NA	NA	.001	.003	.002	.026	.024	/009	.001	.001	.177
2/77	66.4	2.028	.757	.001	.003	.002	.020	.028	/009	.001	.001	.276
3/77	41.1	2.510	.911	.001	.005	.002	.018	.029	/010	.001	.001	.238
4/77	15.2	1.545	.331	.001	.004	.002	.014	.022	/006	.001	.002	.095
1/78	7.3	1.414	.363	.001	.003	.002	.007	.025	.007	.001	.001	.020
2/78	18.0	1.467	.538	.001	.003	.002	.008	.025	.010	.001	.001	.106
3/78	22.0	1.108	.550	NA	NA	NA	.006	.023	.008	.001	NA	.077
4/78	11.4	1.757	.355	NA	NA	NA	.005	.028	.006	.001	NA	.015
1/79	6.4	1.431	.395	NA	NA	NA	.006	.019	.005	.000	NA	.007

Correlation Coefficients - Henrieville

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.52	0.26	0.03	0.39	0.14	0.55	0.38	0.46
Al	-	1.00	0.06	-0.02	0.54	-0.20	0.70	-0.01	0.19
Cu	-	-	1.00	0.00	0.16	-0.35	0.34	0.05	-0.01
Pb	-	-	-	1.00	0.04	0.08	0.12	0.14	0.27
Mn	-	-	-	-	1.00	0.11	0.62	0.17	0.22
Ni	-	-	-	-	-	1.00	0.06	-0.23	-0.11
Fe	-	-	-	-	-	-	1.00	0.24	0.24
SO_4	-	-	-	-	-	-	-	1.00	0.56
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Henrieville

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	417	112	237	275	186	46	352	194	194
Al	-	112	19	83	57	17	98	94	94
Cu	-	-	237	167	127	20	229	51	51
Pb	-	-	-	275	154	35	239	127	127
Mn	-	-	-	-	186	30	177	73	73
Ni	-	-	-	-	-	46	39	30	30
Fe	-	-	-	-	-	-	352	136	136
SO_4	-	-	-	-	-	-	-	194	194
NO_3	-	-	-	-	-	-	-	-	194

Huntington Canyon #1, Utah (SAROAD Site Number 460280001Ko3)

This station is about 6.4 km west of the Huntington power plant, both of which are located at the bottom of the canyon, enclosed by steep, rocky walls. Vegetation is moderate. The road up the canyon is paved. Operated by a field employee of URL, the station is equipped with a singl high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/77	22.1	.890	.536	.001	.003	.002	.010	.033	.007	.001	.001	.153
3/77	22.9	2.423	.746	.001	.004	.003	.029	.041	.007	.001	.001	.131
4/77	17.0	2.163	.455	.001	.004	.003	.027	.022	.005	.001	.001	.111
1/78	12.9	4.250	1.220	.001	.003	.002	.007	.026	.005	.001	.001	.031
2/78	18.3	1.740	.651	NA	NA	NA	.006	.026	.007	.001	NA	.112
3/78	22.0	1.106	.627	NA	NA	NA	.006	.037	.008	.001	NA	.080
4/78	18.1	3.071	.745	NA	NA	NA	.006	.041	.006	.001	NA	.033
1/79	17.9	5.213	1.950	NA	NA	NA	.005	.020	.005	.000	NA	.025

Correlation Coefficients - Huntington Canyon #1

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.44	-0.03	0.30	0.14	-0.07	0.60	0.17	0.28
Al	-	1.00	-0.43	0.16	0.33	-0.39	0.69	0.09	0.35
Cu	-	-	1.00	0.11	0.08	0.35	-0.07	-0.09	-0.05
PB	-	-	-	1.00	0.34	-0.31	0.14	0.17	0.23
Mn	-	-	-	-	1.00	-9.98	0.32	0.24	-0.02
Ni	-	-	-	-	-	1.00	0.50	-0.03	-0.18
Fe	-	-	-	-	-	-	1.00	0.06	0.10
SO_4	-	-	-	-	-	-	-	1.00	0.46
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Huntington Canyon #1

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	209	90	76	168	63	23	185	135	134
Al	-	90	7	79	36	12	84	70	69
Cu	-	-	76	66	26	9	74	34	33
Pb	-	-	-	168	58	22	152	110	109
Mn	-	-	-	-	63	9	63	37	37
Ni	-	-	-	-	-	23	19	13	13
Fe	-	-	-	-	-	-	185	118	117
SO_4	-	-	-	-	-	-	-	135	134
NO_3	-	-	-	-	-	-	-	-	134

Huntington Canyon # 2, Utah (SAROAD Site Number 460280003K03)

This station is located near the mouth of the canyon containing the Huntington power plant, about 6.4 km from the power plant and 4.8 km east of Huntington. The land adjacent to the station is farmed, but the surrounding areas are only sparsely vegetated. The road to the station is paved. The station, operated by a field employee of URL, is equipped with a single high volume air sampler and a flow recorder. Commercial power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	CD	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
2/77	25.9	2.057	.723	.001	.003	.002	.017	.027	.007	.001	.001	.171
3/77	25.5	2.589	1.025	.001	.004	.003	.027	.042	.007	.001	.001	.228
4/77	20.9	2.547	.751	.001	.006	.003	.065	.048	.007	.001	.001	.231
1/78	15.1	3.847	1.886	.001	.003	.002	.026	.047	.005	.001	.001	.044
2/78	19.4	2.240	.834	NA	NA	NA	.030	.037	.008	.001	NA	.170
3/78	23.0	.602	.637	NA	NA	NA	.040	.040	.008	.000	NA	.137
4/78	28.4	3.724	1.361	NA	NA	NA	.023	.023	.008	.001	NA	.148

Correlation Coefficients - Huntington Canyon #2

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.50	0.07	0.28	0.11	-0.16	0.47	0.18	0.24
Al	-	1.00	0.17	0.21	0.18	-0.08	0.72	-0.03	0.24
Cu	-	-	1.00	0.40	0.57	0.74	0.23	0.04	-0.12
PB	-	-	-	1.00	0.40	-0.31	0.18	0.19	0.25
Mn	-	-	-	-	1.00	0.67	0.29	0.26	0.00
Ni	-	-	-	-	-	1.00	0.03	-0.12	-0.10
Fe	-	-	-	-	-	-	1.00	-0.06	-0.12
SO_4	-	-	-	-	-	-	-	1.00	0.52
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Huntington Canyon #2

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	171	72	159	161	71	20	165	108	108
Al	-	72	66	69	40	8	71	53	53
Cu	-	-	159	153	70	20	154	99	99
Pb	-	-	-	161	70	19	157	100	100
Mn	-	-	-	-	71	10	71	43	43
Ni	-	-	-	-	-	20	19	14	14
Fe	-	-	-	-	-	-	165	104	104
SO_4	-	-	-	-	-	-	-	108	108
NO_3	-	-	-	-	-	-	-	-	108

Navajo Mountain, Utah (SAROAD Site Number 460960001K03)

This station is on the Navajo Indian Reservation near the Rainbow Bridge National Monument, about 64 km east of the Navajo Generating Station and 80 km southeast of the proposed Kaiparowits Plateau development. It is an extremely remote and isolated area, with mountainous terrain to the west and Lake Powell to the west and north and many rough, steep-walled canyons in the area. The soil is sandy. The nearest paved road is 56 km from the station. Operated by a field employee of URL, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/77	30.7	1.826	.692	.001	.003	.002	.025	.025	.006	.000	.001	.144
2/77	41.1	.822	.843	.001	.003	.002	.015	.034	.009	.001	.001	.192
3/77	27.4	2.170	1.343	.001	.004	.003	.019	.022	.009	.001	.003	.145
4/77	32.5	3.490	1.662	.001	.004	.003	.049	.022	.011	.001	.001	.149
1/78	7.4	1.543	.420	.001	.003	.002	.066	.021	.005	.000	.001	.010
2/78	24.1	1.050	.725	NA	NA	NA	.049	.019	.016	.001	NA	.185
3/78	28.6	.545	.645	NA	NA	NA	.011	.022	.012	.001	NA	.128
4/78	19.6	3.364	.615	NA	NA	NA	.121	.025	.009	.001	NA	.077
1/79	6.8	1.697	.552	NA	NA	NA	.012	.040	.005	.000	NA	.014

Correlation Coefficients - Navajo Mountain

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.87	-0.02	0.04	0.57	0.07	0.57	0.19	0.31
Al	-	1.00	0.04	0.14	0.91	0.02	0.85	-0.03	0.20
Cu	-	-	1.00	0.12	-0.06	-0.01	-0.05	0.13	-0.02
Pb	-	-	-	1.00	0.03	0.36	-0.06	0.23	0.26
Mn	-	-	-	-	1.00	0.06	0.80	-0.10	0.04
Ni	-	-	-	-	-	1.00	-0.03	0.56	0.28
Fe	-	-	-	-	-	-	1.00	-0.06	0.13
SO_4	-	-	-	-	-	-	-	1.00	0.66
NO_3	-	-	-	-	-	-	-		1.00

Number of Observations - Navajo Mountain

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	287	136	262	191	161	34	243	193	193
Al	-	136	131	106	95	23	121	109	109
Cu	-	-	262	185	155	34	223	176	176
Pb	-	-	-	191	127	27	164	129	129
Mn	-	-	-	-	161	29	159	103	103
Ni	-	-	-	-	-	34	32	26	26
Fe	-	-	-	-	-	-	243	154	154
SO_4	-	-	-	-	-	-	-	193	193
NO_3	-	-	-	-	-	-	-	-	193

Oljato, Utah (SAROAD Site Number 460960002K03)

This station is in Monument Valley on the Navajo Indian Reservation, about 105 km east of the Navajo Generating Station and 136 km west of the Four Corners power plant. Massive, rocky mesas and plateaus rear above the typically flat terrain. The soil is sand with sparse vegetation. U.S. Highway 163 is 0.8 km from the station. Operated by a field employee of URL,

the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
1/76	34.3	NA	NA	.001	.004	.003	.034	.022	.005	.002	.001	.042
2/76	38.2	NA	NA	.001	.003	.003	.031	.028	.005	.001	.001	.235
3/76	19.7	NA	NA	.001	.003	.002	.029	.019	.007	.000	.001	.158
4/76	21.3	3.483	2.185	.001	.003	.002	.040	.028	.006	.000	.001	.153
1/77	21.7	1.029	.967	.001	.003	.002	.025	.025	.008	.001	.001	.184
2/77	34.6	.667	.724	.001	.003	.002	.031	.025	.009	.001	.001	.024
3/77	25.5	2.299	1.233	.001	.005	.003	.105	.026	.008	.001	.003	.125
4/77	19.1	2.325	1.035	.001	.006	.004	.141	.025	.007	.000	.002	.121
1/78	9.0	2.306	.684	.001	.003	.002	.091	.018	.006	.000	.001	.024
2/78	16.2	.529	.542	NA	NA	NA	.054	.022	.010	.001	NA	.119
3/78	19.9	.842	.773	NA	NA	NA	.054	.023	.010	.001	NA	.082
4/78	16.1	3.338	.784	NA	NA	NA	.121	.033	.007	.001	NA	.018
1/79	3.6	2.810	.960	NA	NA	NA	.030	.040	.005	.000	NA	.002

Correlation Coefficients - Oljato

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.58	-0.06	0.02	0.28	0.05	0.32	0.10	0.12
Al	-	1.00	0.10	0.30	0.64	0.35	0.71	0.17	0.45
Cu	-	-	1.00	0.26	-0.11	-0.15	0.00	0.30	0.19
Pb	-	-	-	1.00	-0.11	-0.07	-0.14	0.36	0.38
Mn	-	-	-	-	1.00	0.46	0.65	-0.24	-0.18
Ni	-	-	-	-	-	1.00	0.27	-0.14	-0.30
Fe	-	-	-	-	-	-	1.00	-0.09	-0.08
SO_4	-	-	-	-	-	-	-	1.00	0.51
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - Oljato

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	354	77	325	240	155	38	313	119	119
Al	-	77	74	59	45	10	63	61	61
Cu	-	-	325	235	144	37	288	112	112
Pb	-	-	-	240	121	32	213	86	86
Mn	-	-	-	-	155	21	155	49	49
Ni	-	-	-	-	-	38	31	13	13
Fe	-	-	-	-	-	-	313	99	99
SO_4	-	-	-	-	-	-	-	119	119
NO_3	-	-	-	-	-	-	-	-	119

St. George, Utah (SAROAD Site Number 461280002K03)

This station is located on the top of a mesa about 6.4 km southeast of St. George (population about 6,000), 6.4 km west of the proposed Warner Valley power project and 40 km southwest of Zion National Park. The top of the mesa is sandy soil with sparse vegetation. There are no homes or other buildings within 3.2 km of the station. The road to the station is paved. Operated by a field employee of URL, the station is equipped with a single high volume air sampler and a flow recorder. Commercial electrical power is available.

Seasonal Geometric Means

Date	TSP	SO_4	NO_3	Cd	Cr	Co	Cu	Pb	Mn	Ni	Mo	Fe
3/76	28.2	NA	NA	.001	.003	.002	.025	.013	.010	.003	.001	.254
4/76	16.6	.240	1.009	.001	.003	.002	.021	.027	.008	.000	.001	.094
1/77	16.4	.680	.564	.001	.003	.002	.013	.026	.007	.001	.001	.059
2/77	27.7	2.002	1.527	.001	.003	.002	.012	.029	.008	.001	.001	.183
3/77	23.0	1.962	1.711	.001	.004	.002	.010	.038	.008	.001	.001	.121
4/77	17.8	1.534	.830	.001	.005	.003	.016	.030	.008	.001	.002	.162
1/78	6.3	1.114	.665	.001	.003	.002	.012	.020	.005	.001	.001	.016
2/78	25.6	1.603	1.021	.001	.003	.002	.008	.028	.013	.001	.001	.188
3/78	34.4	1.610	1.345	NA	NA	NA	.008	.030	.013	.001	NA	.244
4/78	16.2	1.976	.995	NA	NA	NA	.014	.027	.007	.001	NA	.049
1/79	9.6	1.574	.814	NA	NA	NA	.021	.025	.006	.001	NA	.014
2/79	20.1	2.337	.761	NA	NA	NA	.044	.017	.006	.003	NA	.067

Correlation Coefficients - St. George

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	1.00	0.86	0.08	0.19	0.78	0.04	0.65	0.31	0.46
Al	-	1.00	-0.08	0.33	0.82	-0.11	0.95	0.00	0.28
Cu	-	-	1.00	0.10	-0.09	0.30	0.07	0.20	-0.02
Pb	-	-	-	1.00	0.11	-0.06	0.30	0.15	0.50
Mn	-	-	-	-	1.00	0.09	0.60	0.05	0.27
Ni	-	-	-	-	-	1.00	0.11	0.14	0.14
Fe	-	-	-	-	-	-	1.00	0.07	0.29
SO_4	-	-	-	-	-	-	-	1.00	0.52
NO_3	-	-	-	-	-	-	-	-	1.00

Number of Observations - St. George

	TSP	Al	Cu	Pb	Mn	Ni	Fe	SO_4	NO_3
TSP	358	139	251	266	185	56	310	204	205
Al	-	139	95	118	84	28	126	119	120
Cu	-	-	251	201	133	44	220	142	143
Pb	-	-	-	266	158	44	241	159	160
Mn	-	-	-	-	185	31	181	102	103
Ni	-	-	-	-	-	56	52	44	44
Fe	-	-	-	-	-	-	310	171	172
SO_4	-	-	-	-	-	-	-	204	203
NO_3	-	-	-	-	-	-	-	-	205